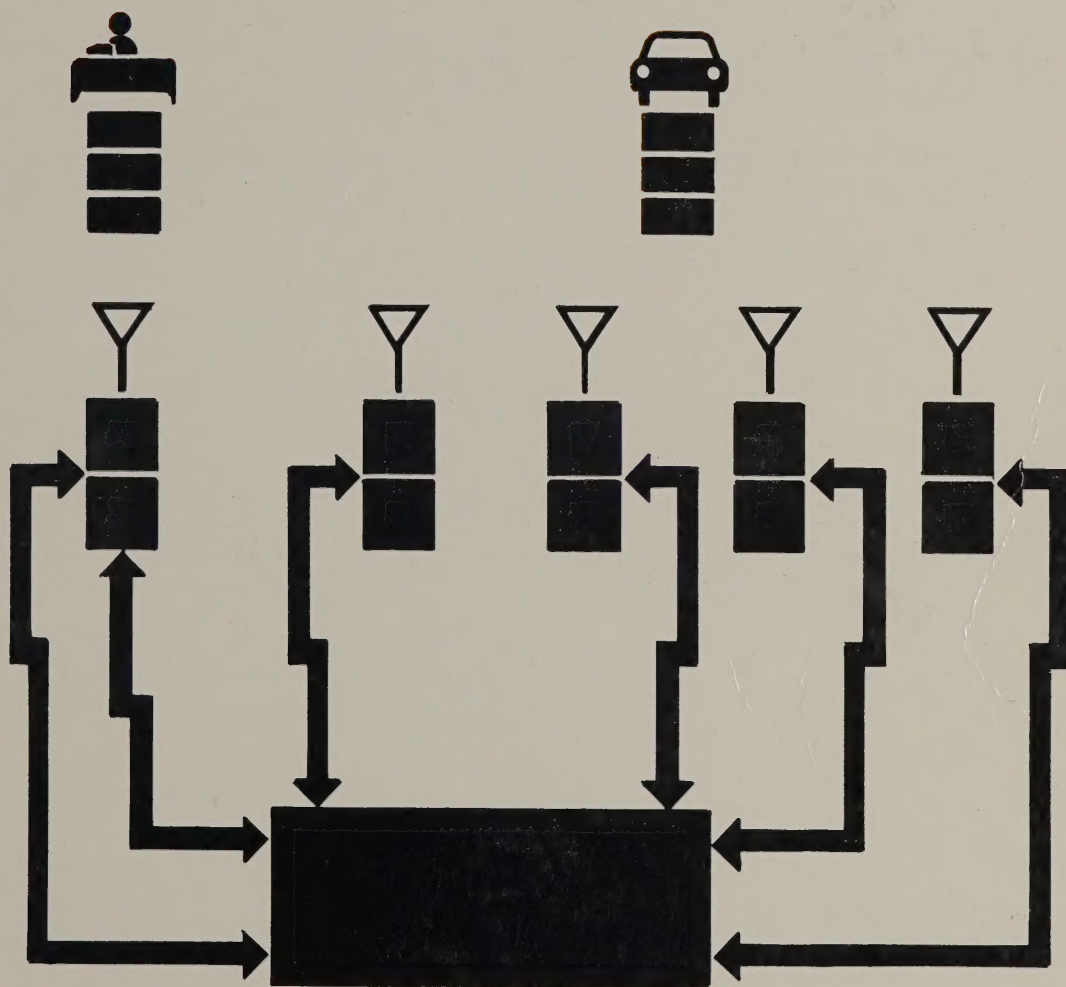




SYSTEM MANAGER'S OPERATING MANUAL For SMARTNET II™ Trunked Radio Systems

T5184 SMARTNET II Central Controller
and Options D162, D163, D401, D413 and D436;
and T5188 Telephone Interconnect and Option D401



Instruction Manual

68P81079E75-O

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EPS-34440-B

68P81112E94-B

instruction manual revision

GENERAL:

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81079E75-O SmartNet™ Trunked Radio Systems
System Manager's Manual

REVISION DETAILS:

The GUARDIAN Interactive System Control program for trunked radio systems has been modified to provide increased functionality. As a result, the operational capabilities the CSAVE command (paragraph 3.8.2.9) and the GRDD command (paragraph 4.2.16) have been improved. The paragraphs that follow describe these improvements.

Please add the following text to your manual.

- Text Added as the last paragraph of 3.8.2.9 - CSAVE COMMAND

The CSAVE command is designed to save talk groups, talk group-to-fleet affiliations, and only those individual records that the user has ACTIVE on the system. Therefore, it is very important that the user DEACTIVATE any individual records that are not being used. Otherwise, ALL individuals are saved due to the fact that they are set to ACTIVE. This greatly increases the amount of time it takes to complete the save of the SAC database. For example, in a Type II system consisting of 4000 mobile units, a CSAVE performed with unused individuals left ACTIVE takes approximately 1 hour and 50 minutes (assuming system has a MCB set at a 2400 baud rate). The same CSAVE performed with unused individual records DEACTIVATED takes about 15 minutes.

- Text Added as the last paragraph of 4.2.16 - GRDD COMMAND

It should be noted that the future implementation of an intelligent MCB Save and Load makes the GRDD command unnecessary. The new MCB Save/Load commands originate from the AUTH prompt and operate similarly to the CSAVE/CLOAD commands (see 3.8.3.9 and 3.8.2.10). Interconnect calls are permitted during the "smart" MCB Save/Load.



MOTOROLA INC.

TECHNICAL SERVICE
DIVISION

instruction manual revision

1. This manual contains the instructions for the use of the Motorola 68000 microprocessor. It is intended for use by the user of the microprocessor and should be read carefully before using the device. The instructions are given in a step-by-step format and are intended to be followed in the order in which they are given. The instructions are given in a step-by-step format and are intended to be followed in the order in which they are given. The instructions are given in a step-by-step format and are intended to be followed in the order in which they are given.

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MOTOROLA INC.

Communications
Sector

SYSTEM MANAGER'S OPERATING MANUAL

FOR SMARTNET II TRUNKED RADIO SYSTEMS

T5184 SMARTNET II CENTRAL CONTROLLER
AND OPTIONS D162, D163, D401, D413 AND D436;
AND T5188 TELEPHONE INTERCONNECT AND OPTION D401

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1. GENERAL

This operating manual explains how the system manager's terminal is used to communicate with an interactive computer program used by the Motorola Trunked Radio System. The program enables the system manager's terminal to perform various functions, such as: equipment and status alarm reporting; adjustment of the system timing parameters; channel activity status reporting; etc. The name of the interactive system control program is GUARDIAN (GRD).

Each command that can be entered via the system manager terminal is explained and typical examples are given. This operating manual shows how to interpret the various messages provided by the system. Also discussed are: the automatic system alarm capability; relay-activated external alarms; and the basic structure of the system, fleets and talk groups.

All system firmware (EPROMs) must be of the same model version for proper system operation. For example, B version MCB software must run with B version CSC firmware as well as B version PLIB firmware. Any combinations of A and B version firmware may cause improper system operation. (Refer to Trunked System Central Interconnect Terminal manual 68P81063E20 for firmware kit numbers.)

This manual covers the following models and options.

- T5184 *Smartnet II* Central Controller
- Option D162 Time-Out-Parameter Control
- Option D163 Telephone Interconnect (4 channel)
- Option D401 Telephone Interconnect (9 channel)
- Option D413 Subscriber Access Control
- Option D436 Centralized Billing
- T5188 Telephone Interconnect (4 channel)
- Option D401 Telephone Interconnect (9 channel)

2. SYSTEM CONTROL INTERFACE PROGRAM

2.1 INTRODUCTION

The Motorola Trunked Radio System employs an interactive computer program that allows the system manager to use the system manager's terminal to query the status of the trunked system base repeaters. In addition, it allows the system manager to enable or disable the base repeaters. The computer program also allows the system manager to modify, as desired, selected system operating characteristics.

Throughout this manual, we refer to "interconnect models" to indicate those items that apply only when the T5184 was ordered with either options D163 or D401, or T5188 (with or without option D401) has been added to a T5184. Option D163 and T5188 add telephone interconnect on 4 channels while D401 or T5188 with D401 add telephone interconnect on 9 channels.

The computer program, named GUARDIAN, is accessed via an RS-232-C terminal connector located on the backplane of the CIT (Central Interconnect Terminal) for interconnect models, and the back of the CSC (Central Site Controller) for non-interconnect units. Refer to the RS-232-C system manager terminal connector in Figures 1 and 2.

The system manager's terminal can be either locally attached (within 50 cable feet, maximum, of the central controller, or remotely linked, via dial up or dedicated phone lines and modems.

2.2 SYSTEM MANAGER CAPABILITIES

2.2.1 Introduction

A system manager terminal provides the following functions:

- Equipment status and alarm reporting.
- Individual channel on/off capability.
- Adjustment of the system timing parameters.
- Channel activity status reporting.

- Date and time information entry for event testing.
- Entry of fleet to talk group affiliations.
- Adjustment of shared service algorithms.
- Interconnect activity status.

For interconnect models:

- Individual interconnect circuit on/off capability.
- Entry of individuals on the positive subscriber list to selectively enable access to interconnect.
- Entry of airtime and TELCO billing parameters.
- Airtime and TELCO charge reporting.
- Toll call records captured/displayed

2.2.2 Data Format and Transmission

All communications between the trunked system central controller and the system manager's terminal (or other peripheral equipment) employs unformatted strings of asynchronous ASCII characters. Each character frame comprises 10 bits having the following structure:

- A single start bit.
- An 8-bit information field.
- A single stop bit.

The 8-bit information field consists of a 7-bit ASCII character code and an eighth bit that is always zero. No parity bit is generated by the central controller, and any parity bit in accompanying transmissions from the terminal or other peripheral device is ignored. Refer to Table 1 for a complete ASCII character set.

The system manager's terminal/central controller communications link baud rate is selectable by a jumper located on the master controller (MCB) board module for interconnect models and on the central site controller (CSC) for non-interconnect models. Any one of the following baud rates can be selected: 110, 300, 600, 1200, 1800, 2400, 3600, 4800 or 9600. Provisions for programming higher data rates are also contained on the MCB board. However, data rates in excess of 4800 baud should not be used at the system manager's terminal.

2.3 HARDWARE REQUIREMENTS

2.3.1 System Manager's Terminal

There are many different terminals available today that can be used with the system manager port. Motorola offers the TDN7010 terminal. Other manufacturers supply dozens of others. In addition to these terminals, it is also possible to use a personal computer running a communications package or a terminal emulator package. All of these terminals or PCs must use the standard ASCII character set described in Table 1. The device should have the following characteristics: "Rate: up to 4800 baud (hard copy terminals are typically limited to 300 to 1200 baud). "Communications: RS-232-C link.

2.3.2 Null Modem Cabling

If the terminal is connected directly to the trunked central controller via a cable (50 feet maximum), a null modem cable is required at the trunked central controller. Refer to Figure 2 for construction details.

The terminal can be remotely linked to the central controller via telephone lines and modems. In this configuration, a standard RS-232-C cable connects the trunked central controller to the modem at the site. This cable is not a null modem cable. A standard RS-232-C cable can be purchased at a local computer supply store.

2.3.3 Modems

Modems used to remotely link the terminal to the trunked central controller should have the following characteristics:

- Rate: up to 4800 baud (must be consistent with baud rate of terminal) - limited generally from 300 to 1200 baud for hard copy equipment.
- Modulation: frequency-shift keying (FSK)

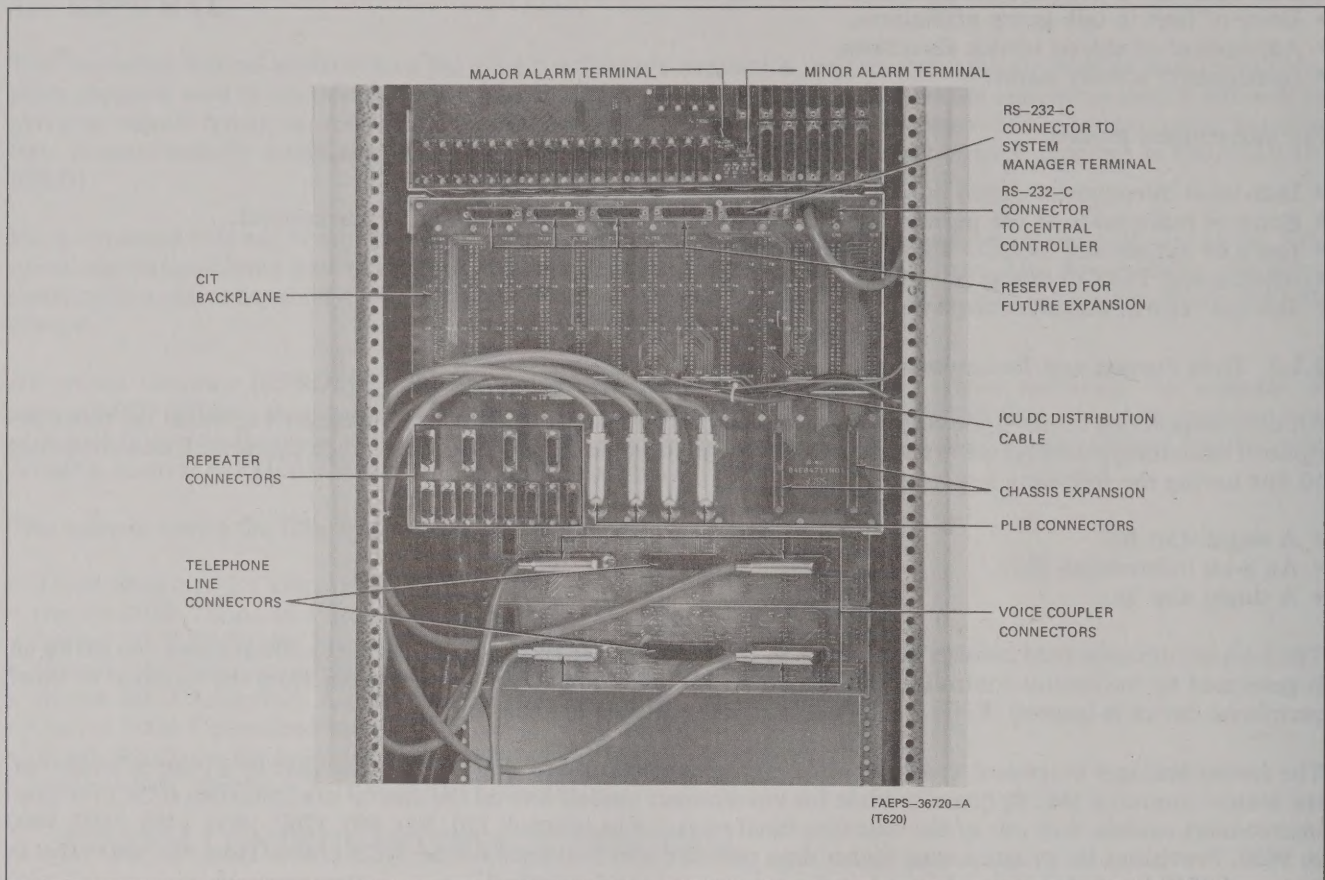


Figure 1. Connector Locations for Model T5184 with Options D163 or D401

- Communications: asynchronous, duplex.
- Line interface: two-wire (dedicated or dial up).
- Terminal interface: RS-232-C.

NOTE

The Bell System Model 103A Modem meets the 300 baud requirements. This modem or equivalent can be used.

Modems should be carefully selected to insure their compatibility with the equipment to which they are interfaced. The basic requirement is that the modems must provide for asynchronous, full duplex communications between the trunked system central controller and the system manager's terminal or other peripheral device.

The modem baud rate must also be carefully selected to satisfy the intended application.

For low-speed asynchronous data communications (1200 baud or less), straightforward FSK modulation techniques are used, and full duplex communications can occur on a leased two-wire telephone company circuit. These low-speed modems generally operate over unconditioned, voice grade lines. However, the grade of telephone line conditioning requirements must conform to the specifications set by the modem manufacturer.

Modems that operate at higher data rates are more expensive. Moreover, they may require the use of improved grade lines. Full duplex operation requirements can be satisfied only by leasing a 4-wire telephone company circuit.

Modems operating at baud rates of 1800 usually employ more sophisticated modulation schemes and operate in an asynchronous mode. Consequently, some form of synchronous to asynchronous conversion device would be required. Again, 4-wire conditioned telephone company lines should be used.

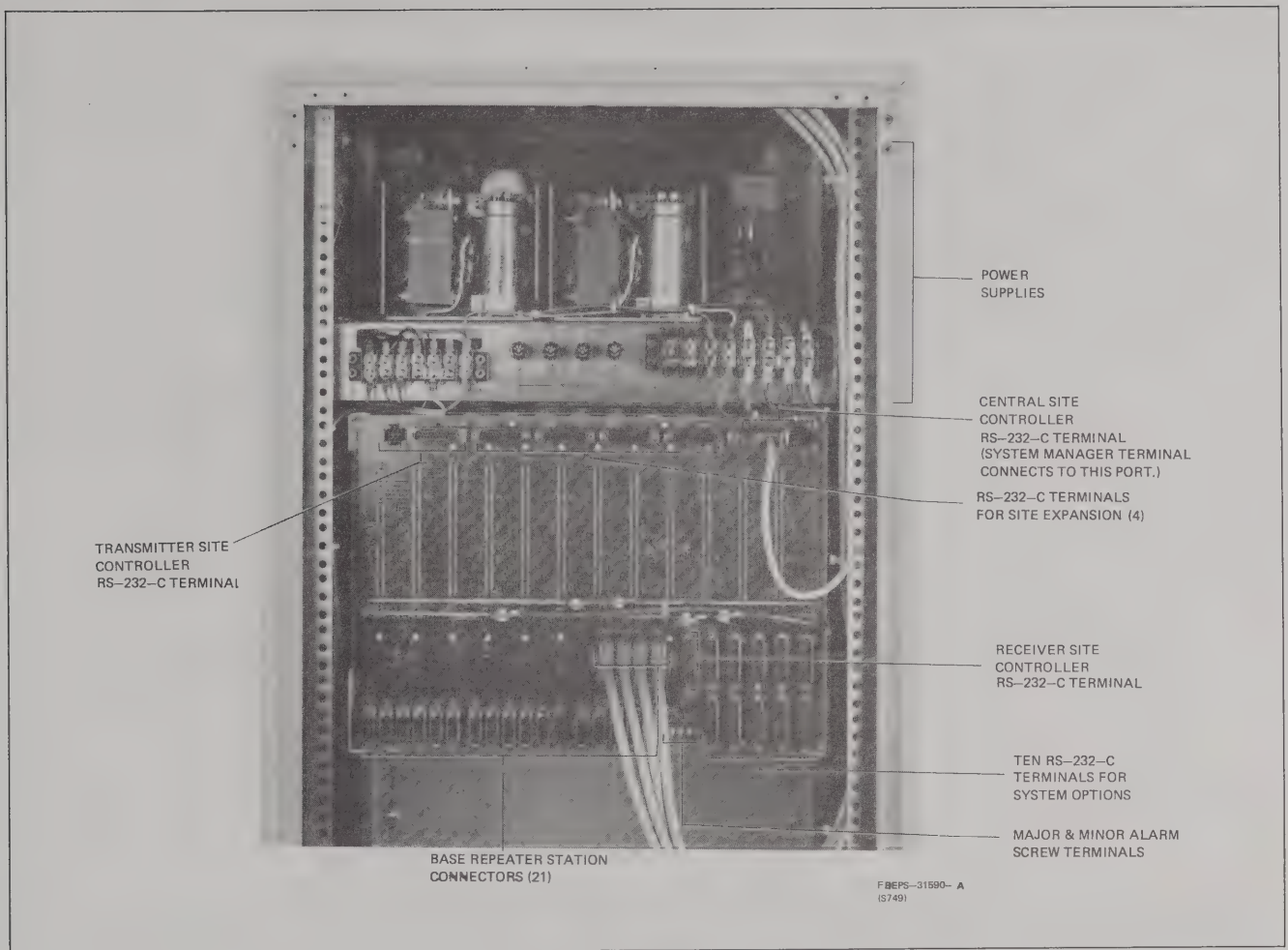


Figure 2. Connector Locations for Model T5184 without options D163 or D401

When the lines are leased from a telephone company that provides a data communication service, it is strongly recommended that the modems (or data sets) be also leased from the carrier. This arrangement may reduce any problems that could arise between the telephone company and the user, should the data communication link (modems and leased lines) fail to operate in a satisfactory manner.

2.3.4 Other Peripheral Devices

In most applications, the peripheral device connected to the system manager's interface consists of a keyboard terminal with either hard-copy capability or CRT display.

2.3.5 T5188 or T5188 with Option D401, or, T5184 with D163/D401 Central Interconnect Terminal Adjustments

When an RS-232-C terminal is locally connected by plugging it into the CIT RS-232-C connector (Figure 1), or is remotely linked via modems, and is set to communicate at the rate of 300 baud, no adjustments to the interconnect terminal are required. This is the recommended configuration for connecting the system manager's terminal to the central interconnect terminal (CIT).

If a baud rate other than 300 is desired, it can be jumper-selected on the master control (MCB) board module located in the central interconnect terminal card cage. For the following discussion, refer to the Master Control Board instruction section in instruction manual 68P81063E20.

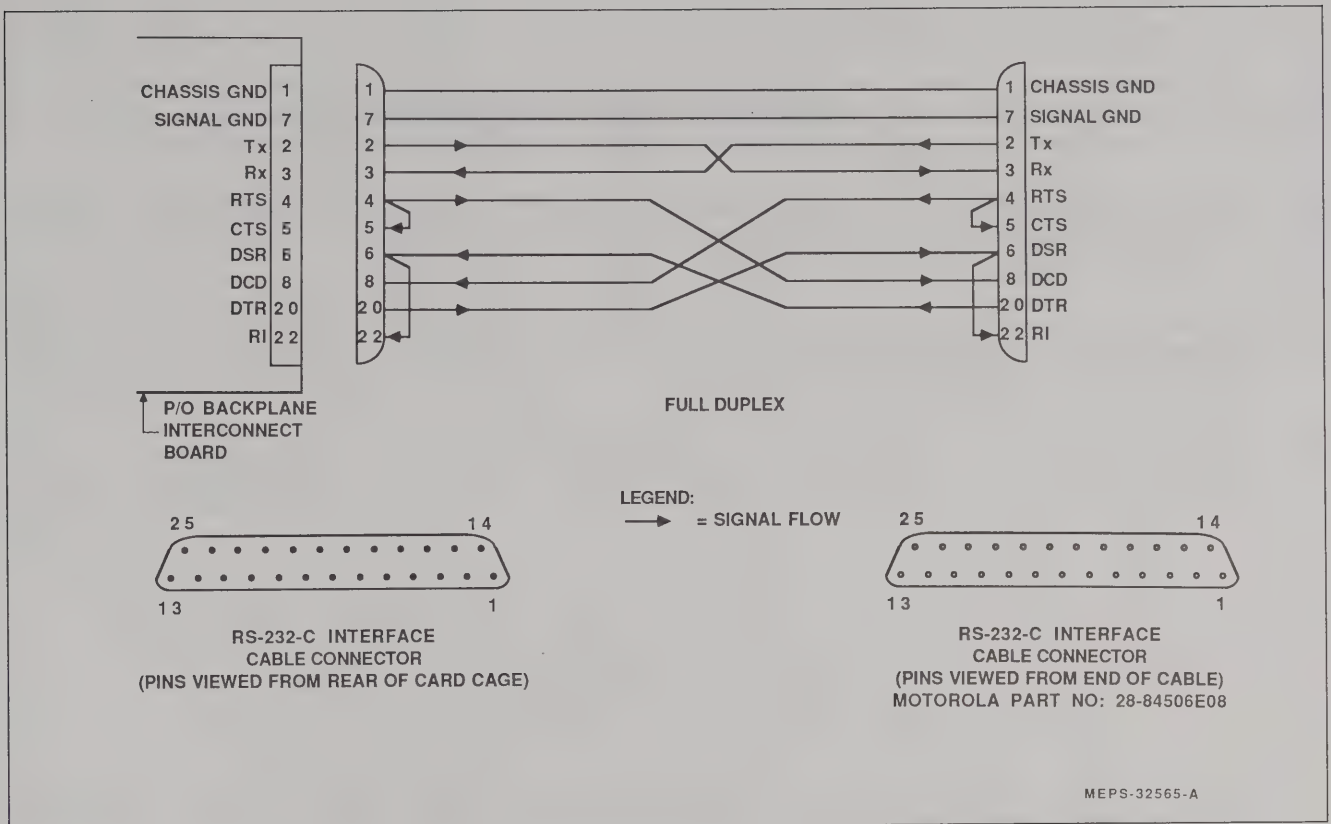


Figure 3. Null Modem Cable

Turn off the central interconnect terminal card cage power and remove the MCB board module from the card cage. Three jumpers are located in the lower left-hand corner of the MCB board. Move the jumper JU13, in the rightmost column (labeled ADDRESS 8104-8105 on the MCB board), to the desired baud rate position.

Move only jumper JU13 (for ADDRESS 8104). Jumpers JU14 and JU15 (for ADDRESSes 8102 and 8100, respectively) should not be moved. Be sure that the selected baud rate is identical to that of the system manager's terminal (as well as to that of the modem, if a modem is used).

2.3.6 T5184 Central Controiler Adjustments

When an RS-232-C terminal is locally attached by plugging it into the CSC RS-232-C connector (Figure 2) or is remotely linked via modems, and is set to communicate at the rate of 300 baud, no adjustments to the central controller are required. This is the recommended configuration for connecting the system manager's terminal to the trunked central controller.

If a baud rate other than 300 is desired, it can be jumper-selected on the central site controller (CSC) board module located in the trunked central controller card cage. For the following discussion, refer to the Central Site Controller Board instruction section in instruction manual 68P81066E60.

Turn off the central controller card cage power and remove the CSC board module from the card cage. Three jumpers are located in the lower left-hand corner of the CSC board. Move jumper JU15, in the rightmost column (labeled ADDRESS 8100-8101 on the CSC board), to the desired baud rate position.

Move only jumper JU15 (for ADDRESS 8100). Jumpers JU13 and JU14 (for ADDRESSes 8104 and 8102, respectively) should not be moved. Be sure that selected baud rate is identical to that of the system manager's terminal (as well as to that of the modem, if a modem is used).

2.4 USER NOTES

NOTE

All input data entered by the system manager is shown in reverse type to distinguish it from the messages printed by the system. For example, **this line is shown in reverse type of the style** used to indicate user input.

- To facilitate interfacing with smart terminals or Personal Computers that are running “SMART” communications programs, all output going to the system manager are always terminated in either a carriage return (ASCII HEX code 0D) or an ETX character (ASCII HEX code 03).
- All subsystem prompts always end in the sequence “>”, space, ETX and the “>” is always in the 5th column, the space in the sixth and the ETX in the 7th. This should make it easier for the smart terminals to identify when they are talking to a subsystem. Examples are:

Prompt
GRD> (ETX)
SAC> (ETX)
DIAG> (ETX)
AUTH> (ETX)
BILL> (ETX)
CHAN> (ETX)
PARM> (ETX)

- All sections that require specific input from the system manager always ends with the sequence “?” or “:” followed by a space and by either a (cr) or an (etx). Examples are:

Messages requiring user input
EXCHANGE? (etx)
CORRECT (Y/N)? (etx)
CHANGE TIME (HH:MM:SS) TO: (etx)
ENTER CURRENT PASSWORD: (etx)
ENTER AREA CODE (XXX)? (etx)
ENTER CUSTOMER GROUP: (etx)

- “>”, “:” or “?” are the prompt message characters by which the program requests valid command word entry (from the system manager) to begin a program subroutine.
- The RUB OUT and BACKSPACE keys remove the previously entered character from the terminal’s input buffer and causes the cursor or carriage to back up one character for each RUB OUT or BACKSPACE character entered. These keys are used to correct user entry errors, before the current line being entered is terminated with the (cr) key.
- Almost all input from the system manager must be terminated by an enter key. This may be a key marked ENTER, CARRIAGE RETURN, NEW LINE, or some other name. This is shown in text in this form: (cr).
- A few inputs need not be followed by a (cr), namely control characters. A control character is entered by pushing and holding down the CONTROL or CTRL key and striking the alphabetic key desired. In this text, a control character is indicated as a upper case CONTROL, a dash and the letter, such as CONTROL-X. CONTROL-X is often used to terminate listing, reports and tape operations. In this case, this does not need to be followed by a (cr).

- Once the system manager logs onto the system, a timer is activated. If there is no input from the user for a 5 minute period of time, the user is automatically logged off the system and the phone line is disconnected (in a dial-up connection only).
- To log off the system control program, the user must first leave a subsystem by use of the QUIT command. Then the user may issue the proper command to exit from the system.
- Whenever the system control program requests a response to a prompt ending with “(Y/N)?”, the user must enter No(cr) or N(cr) for a no answer, or, Yes(cr) or Y(cr) for a yes answer.

2.5 ACCESS TO SYSTEM CONTROL PROGRAM

Access to the system manager control program is accomplished by dialing a phone number for the system's modem (dial-up lines only) and entering a logon name and password. There are 5 logon names.

Each of the logon names have different command capabilities. For example, logon “BILLING” can perform a BILL command but cannot issue a SAC command. Logon “SYSTEM” can perform SAC LIST commands but cannot do a SAC EDIT command. Following is a list of the logon names available and a description of the intended usage for each:

Logon	Description
BILLING	This logon is used for those that will be downloading interconnect billing information. It will be afforded access to all billing listing type commands.
CONTROL	This logon is used to perform the various SAC functions and to control usage of system resources. This is the logon that will most often be used by the system manager.
MASTER	The MASTER logon is used to access all system functions and has the ability to change the passwords for all of the other logons.
SYSTEM or SYSTxxxx	This is the logon normally used by service personnel. It is afforded all of the commands normally used by to service systems. It is given access to all system functions required to analyze and maintain the system. The contents of all system tables and authorization settings are visible. This logon can perform listing functions in any sub-system.

When a user is ready to access the system, the system's telephone number must be called if the system is equipped with dial-up access. If the system manager terminal is locally attached, this step is not necessary. The user must then enter one or more (cr) keys until the system greets the user and asks the user for a logon name. One of the 5 logon names listed above must be entered. If an incorrect logon is entered 3 times, the logon process aborts. Dial-up lines disconnect and the system manager port does not respond for 2 minutes.

After successfully entering a logon name, the system asks for the password for that logon (unless the password was set to “NULL” by the MASTER name). Following are the default system passwords that are in effect whenever the system is first made operational or after a memory loss:

Logon	Password
BILLING	TRUNKING
CONTROL	TRUNKING
MASTER	\$MASTERS\$
SYSTEM or SYSTxxxx	TRUNKING

If an incorrect password is entered 5 times, the logon process aborts. Dial-up lines disconnect and the system manager port does not respond for 2 minutes.

When the user has successfully logged onto the system, the user is given the date, time, system number, version of the CSC (and MCB, if installed) and the status of the diagnostic system. The user then sees guardian prompt "GRD>".

NOTICE: With this new logon procedure, it is possible to emulate the method of system access used by earlier Motorola Trunked Radio Systems by using the form "SYSTxxxx" where the system number is placed in the "xxxx" position of the logon (for example, "SYST0509"). The system manager must log in with the MASTER logon and change the SYSTEM logon password to "NULL".

It is assumed that most managers want passwords on all logons to ensure secure access to the system. For this reason, the system has been designed to prohibit the users of BILLING, CONTROL and SYSTEM logons from removing their passwords. Each of these logons has the liberty to change their passwords at any time, but the user logged on under that logon cannot remove the password. The MASTER logon alone can set a password to "NULL".

The system manager may logon with the MASTER logon and change passwords for each of the other logons. Refer to section 3.7 for details.

Following are samples of logons to the system. Example a. assumes that this is the first logon after system is powered up. Example b. demonstrates the case of a normal logon after the date and time are established, the diagnostics set to manual mode and the password changed from the default. Example c. is for a successful logon for the SYSTEM logon where the MASTER logon has set the password to "NULL". Example d. demonstrates an illegal logon attempt where the user does not know the proper logons available. Example e. demonstrates an illegal logon attempt where the proper password for the logon used is not known.

After initial system start up, or after a loss of all system memory, error messages may be seen prior to the MCB version number. The system manager can change this feature so that error messages are seen only when the proper command is used to see them. Refer to section 3.5 on the DIAG command for details. At logon, you are told if the diagnostics are in MANUAL or AUTOMATIC mode.

LOGON Error Messages are as follows.

- **PASSWORDS CORRUPTED, SET TO DEFAULTS** - The system has determined that the passwords have been corrupted. The default passwords are now in effect.
- **CODE PLUG PASSWORDS CORRUPTED, SET TO NULL** - The system has determined that the code plug passwords have been corrupted. No passwords are in effect, having been set to null.
- **DRAM MALFUNCTION IN PASSWORDS** - The dynamic RAM in which the passwords reside was found to be bad. This RAM should be checked immediately and replaced, if necessary. If this error occurs, the user is automatically logged in without having to enter a password.

Example a. (1st logon after system startup)

```
(cr)
SYSTEM 153B, LOGON PLEASE: CONTROL(cr)
PASSWORDS CORRUPTED, SET TO DEFAULTS
ENTER PASSWORD: TRUNKING(cr) (not echoed on terminal)
COPYRIGHT MOTOROLA INC. 1987. ALL RIGHTS RESERVED.
LOGGED ON AS CONTROL AT 0:00:35 SUNDAY 0/00/00
AUTOMATIC DIAGNOSTICS
CSC VERSION xxxx
*DIAG* 0:01:51 0/00/00 MA 00 CSC EO 0F 0A 08
*DIAG* 0:01:51 0/00/00 MA 00 CSC EO 0F 0E 0F
*DIAG* 0:01:51 0/00/00 MA 00 CSC EO 0F 0E 0E
MCB VERSION xxxx

GRD>
```

Example b. (Subsequent logon)

```
(cr)
SYSTEM 153B, LOGON PLEASE: CONTROL(cr)
ENTER PASSWORD: Johnny(cr) (not echoed on terminal)
COPYRIGHT MOTOROLA INC. 1987. ALL RIGHTS RESERVED.
LOGGED ON AS CONTROL AT 8:40:16 WEDNESDAY 10/14/87
MANUAL DIAGNOSTICS
CSC VERSION xxxx
MCB VERSION xxxx

GRD>
```

Example c. (Logon with no password)

```
(cr)
SYSTEM 0509, LOGON PLEASE: syst0509(cr)
COPYRIGHT MOTOROLA INC. 1987. ALL RIGHTS RESERVED.
LOGGED ON AS SYST0509 AT 9:55:37 TUESDAY 10/20/87
MANUAL DIAGNOSTICS
CSC VERSION xxxx
MCB VERSION xxxx

GRD>
```

Example d. (Invalid logon)

```
(cr)
SYSTEM 0509, LOGON PLEASE: TEST(cr)
INVALID ID. LOGON PLEASE: JOHN(cr)
INVALID ID. LOGON PLEASE: WHAT(cr)
INVALID ID.
*** SESSION TERMINATED *** (Dial-up line would be disconnected now.)
```

Example e. (Invalid password)

```
(cr)
SYSTEM 153B, LOGON PLEASE: SYST153B(cr)
ENTER PASSWORD: CHEESE(cr) (not echoed on terminal)
INVALID PASSWORD. ENTER PASSWORD: WINTER(cr) (not echoed on terminal)
INVALID PASSWORD. ENTER PASSWORD: SUMMER(cr) (not echoed on terminal)
INVALID PASSWORD. ENTER PASSWORD: AUTUMN(cr) (not echoed on terminal)
INVALID PASSWORD. ENTER PASSWORD: SPRING(cr) (not echoed on terminal)
INVALID PASSWORD.
*** SESSION TERMINATED *** (Dial-up line would be disconnected now.)
```


2.6 HELP SYSTEM

At the GRD> prompt, and at most other subcommand prompts, the word "Help" or "?" can be entered to obtain a list of all commands that can be performed by the LOGON that was used. Example:

```
GRD> HELP(cr)

AVAILABLE COMMANDS FOR YOUR LOGON ID ARE:
  BYE
  EXIT
  PASS
  EMRG
  DATE
  TIME
  CHAN
  PARM
  TEST
  SERV
  STAT
  DIAG
  SAC
  AFF
  AUTH
  BILL
  TELL
  VER
  MGC
  DVP

GRD> DIAG(cr)
AUTOMATIC DIAGNOSTICS
DIAG> ?(cr)

AVAILABLE COMMANDS FOR YOUR LOGON ID ARE:
  QUIT
  CLEAR
  PRINT
  AUTOMATIC
  MANUAL

DIAG>
```


2.7 TIMEOUT AND DISCONNECT CONTROL

Throughout the Guardian control program, a 5 minute timer is established for every location where an input is expected from the user. If the 5 minute time limit is exceeded at any of these locations, a message "*** TIMEOUT ***" is seen and the user is logged off the system. The user then has an additional 5 minutes in which to enter a (cr) and log in again. If this time exceeds 5 minutes, then the user sees the message "*** SESSION TERMINATED ***" and the phone connection to the system manager port disconnects (dial up lines only). This ensures that others can have access to the system manager port in cases where a user forgets to log off or disconnect the phone.

If the phone connection is broken while a user is logged into the system, the user is logged off. If the system is immediately redialled, the user has to go through the logon process again. This protects the system from unauthorized access that might occur if the system was to wait for a reconnection and resume. In this mode, there would be no way to determine who made the reconnection without demanding the user to log in again.

2.8 COMMAND INPUT

Throughout the Guardian control program, commands can be entered in either lower or upper case. Password entries must be entered exactly as the password was changed, so if the password was changed to "FunNY", it must always be entered in exactly this manner.

Most commands can be abbreviated to one or more characters. In the text that follows, the required portion of a command is shown in upper case while the optional portion is shown in lower case. When the manual refers to "List Command", this implies that the letter "L" alone is sufficient to identify the command. If more than the required number of characters are entered, the spelling must be correct. The command "List" can be entered as "L", "LI", "LIS", "LIST", "l", "li", "lis" or "list", for example.

3. COMMAND FUNCTIONS AND RESPONSES

The function of each command word is described in Table 2. The "MBCS" column shows which accounts can do which commands. "B" means BILLING, "C" means CONTROL, "S" means SYSTEM or SYSTxxxx, and "M" means MASTER. The valid subcommand responses are shown in Table 3.

Table 2. Subroutine Entry Command Words

Command	Section	MBCS	Subroutine Description
AFF#	3.1	M-CS	Establish, change or list talk group to fleet affiliations
AUTH*	4.1	MBCS	Initialize, query and/or change authorization tables
BILL*	4.2	MBCS	Initialize, query and/or change billing parameters
BYE	3.2	MBCS	Log off system
CHAN	3.3	M-CS	Channel controller
DATE	3.4	M-CS	Query and/or change date and time
DIAG	3.5	M-CS	Set diagnostic method, print/clear message
DVP	3.16	M-CS	Examine/modify digital voice privacy parameters
EMGR	3.14	M-CS	Examine/modify emergency call parameters
EXIT	3.2	MBCS	Log off system
MGC	3.15	M-CS	Examine/modify multi-group call parameters
PARM	3.6	M-CS	System time-out parameters (optional)
PASS	3.7	MBCS	Establish/change logon password
SAC	3.8	M-CS	Subscriber access control
SERV	3.9	M-CS	Interconnected shared service parameters and statistics
STAT	3.10	MBCS	Display status of system
TELL*	4.3	M-CS	Initialize, query and/or change CIT specifications
TEST	3.11	M-CS	Initiate system test
TIME	3.12	M-CS	Query and/or change time
VER	3.13	M-CS	Display system version number

command does not exist in Type I only systems

* with options D163 or D401, or, Model T5188 or T5188 with D401

Table 3. Subcommand Table

Command	Subcommands - Minimum abbreviation shown in upper case
AFF#	Edit, List, Clear, Stats, & Quit
AUTH*	Add, Delete, Edit, List, Pdigit, Quit, Reset, Status, & Update
BILL*	AEXC, CLNG, DECX, GRDD, INIT, LAIR, LEXC, LOGN, LOGY, LTEL, MAIR, MEXC, MTEL, PBXN, PBXY, QUIT, RSET, SAIR, SLNG, & STEL
BYE	none
CHAN	Disable, Enable, Status, Protect, Unprotect, Group, Add, Remove, & Quit
DATE	none
DIAG	Automatic, Clear, Manual, Print, & Quite
DVP	Interconnect, Update, List, Quite
EMGR	Top, Preempt, Reserve, Hold, List, Quite
EXIT	none
MGC	Int, Wait, Quit, Stat
PARM	Carr, Fade, LISt, MAIf, Quit, Recent, LINK, MFst, & Trnk
PASS	If logged on as 'MASTER' - BILLING, MASTER, CONTROL & SYSTEM
SAC	Activate, CLear, CLOad, CSave, Deactive, Edit, LIst, Options, Quite, SEt, & SStats
SERV	Disable, Enable, List, Quit, SET, SETD, & SStats (Instant, Today, Yesterday)
STAT	none
TELL*	Disable, Enable, Phone, Quite, Repeater, & Status
TEST	none
TIME	none
VER	none

command does not exist in Type I only systems

* with options D163 or D401, Model T5188 or T5188 with D401

When the system manager has logged on to the system, the GRD> prompt is seen on the terminal. As various subsystems are entered, the prompt changes. Return to the GRD> prompt is generally made by using the Quit command within subsystems.

There are three error messages that can be seen in response to the entry of a command. These, along with descriptions follow:

- **INVALID COMMAND** - The command entered was not found in the valid command table. Check spelling and proper form of the command.
- **COMMAND NOT INSTALLED** - The command was recognized as a known command from the tables, but the proper model and/or option has not been purchased and the necessary routines are not installed.
- **YOUR ID CANNOT USE COMMAND** - The command is recognized, but the logon ID that was used is not permitted to use the command (i.e., BILLING trying to perform a SAC command).

3.1 AFFILIATE COMMAND

The AFFILIATE processor is used to manage the affiliation of a Type II talk group with a fleet number. The affiliation is required for proper operation of multi-group (fleet-wide) calls and for certain reporting functions. The AFFILIATE command is not available for Type I only systems. It is available for Type II talk groups only. The fleet number must be 4 decimal digits ranging from 0001 to 4095. Talk group IDs must begin with a "T", then an "8", followed by 5 decimal digits ranging from 00001 to 04094. These 5 digits are a direct decimal conversion of the 3 digit hexadecimal talk group ID.

Once the command is issued, the AFF> prompt is seen. Following is a description of the commands that are available to this prompt.

Command	Section	Description
Edit	3.1.1	Add/change/delete a talk group to a fleet
List	3.1.2	List the talk groups affiliated with a fleet
Clear	3.1.3	Clear the entire affiliation table
Stats	3.1.4	Status of affiliation table
Quit	3.1.5	Exit to GUARDIAN prompt GRD>

3.1.1 EDIT Command

The EDIT command is used to add, change, or delete the affiliation between a talk group and a fleet. The syntax is the word EDIT followed by a talk group number. The AFF routine then displays the current affiliation (or a "XXXX" if there is none). If <enter> alone is typed, the affiliation remains as it was. If a new number is entered followed by <enter>, the affiliation is changed to the requested fleet number. If an "X" and <enter> is entered, any previous affiliation is removed. When a talk group is the fleetwide, or multi-group, talk group, that entry should be followed by an asterisk "*".

3.1.2 LIST Command

The LIST command must be followed by the fleet number to be listed. All talk groups are listed that are affiliated with this fleet. If none are found, control returns to the AFF prompt. An "*" denotes a multi-group talk group.

3.1.3 CLEAR Command

This command clears the entire talk group to fleet affiliation table. An "ARE YOU SURE" prompt precedes the clearing of the table.

3.1.4 STATS Command

This command gives the status of the talk group to fleet affiliation table. If any talk group to fleet affiliation has been lost, STATS reports it by printing the corresponding talk group ID. When an affiliation has been lost, it is then set to 0. If more than 255 affiliations have been lost, STATS reports "ALL TALK GROUP TO FLEET AFFILIATIONS HAVE BEEN CLEARED". Once a lost affiliation has been reported, it is then considered to be valid, and, is not reported lost again.

3.1.5 QUIT Command

This command is used to exit from AFF. Control is returned to the GRD prompt. Following is an example of an AFFILIATE session:

```
GRD>
AFF> LIST 2011
FLEET NUMBER 2011

AFF> EDIT T800001
AFFILIATED WITH XXXX    2011*

AFF> EDIT T800222
AFFILIATED WITH XXXX    2011

AFF> LIST 2011
FLEET NUMBER 2011
    T800001*
    T800222

AFF> EDIT T800222
AFFILIATED WITH 2011    2033*

AFF> EDIT T800001
AFFILIATED WITH 2011*   X

AFF> LIST 2011
FLEET NUMBER 2011

AFF> LIST 2033
FLEET NUMBER 2033
    T800222*

AFF> STATS
ALL TALK GROUP TO FLEET AFFILIATIONS ARE VALID

AFF> STATS
THESE TALK GROUP TO FLEET AFFILIATIONS HAVE BEEN CLEARED:

T800020  T800021  T800022  T800023  T800024  T800025  T800026  T800027
T800110  T800111  T800112  T800113  T800114  T800115  T800116  T800117

AFF> CLEAR
ENTIRE TABLE TO BE CLEARED
ARE YOU SURE (Y/N)? Y

AFF> STATS
ALL TALK GROUP TO FLEET AFFILIATIONS ARE VALID

GRD>
```


3.2 EXIT/BYE COMMAND

EXIT and BYE commands terminate the user interface program (GUARDIAN). To resume activity, the user must initiate the logon procedures as described in Section 2.6. After entering either of these commands, the system will wait 5 minutes for the user to enter a logon name. If none is entered, the system issues timeout and session terminated message and causes the phone connection to terminate. Following is a sample sequence:

```
GRD> BYE(cr)
LOGGED OFF AT 8:27:21 THURSDAY 10/29/87

(cr)
SYSTEM 153B LOGON PLEASE: SYST153B(cr)
ENTER PASSWORD: Johnny(cr) (not displayed on terminal)
COPYRIGHT MOTOROLA INC. 1987. ALL RIGHTS RESERVED.
LOGGED ON AS SYST153B AT 8:27:57 THURSDAY 10/29/87
MANUAL DIAGNOSTICS
CSC VERSION xxxx
MCB VERSION xxxx

GRD> BYE(cr)
LOGGED OFF AT 8:28:03 THURSDAY 10/29/87

*** TIMEOUT ***
*** SESSION TERMINATED *** (Dial-up line would be disconnected now.)
```

3.3 CHAN COMMAND

The CHAN command permits the systems manager to enable, disable, or check the current status of a particular channel or a group of channels. The CHAN command also allows the systems manager to display the shared user group channel mapping and to add and remove groups from a particular channel or group of channels. In this text the repeater is referred to as the channel. A list of the CHAN commands are as follows:

COMMAND	DESCRIPTION
S	Displays the STATUS of a particular channel or group of channels
E	ENABLE a particular channel or group of channels
D	DISABLE a particular channel or group of channels
P	PROTECT a particular channel or group of channels
U	UNPROTECT a particular channel or group of channels
G	Displays the status of the shared user GROUPS for a particular channel or group of channels
A	ADD one or more shared user groups to a particular channel or group of channels
R	REMOVE one or more shared user groups from a particular channel or group of channels
Q	QUIT - Exits to the Guardian prompt (GRD>).

Most of the commands accept a channel list in the form of NN or NN-NN or ALL. NN specifies a single channel (1-21). NN-NN specifies a range of channels. ALL specifies all of the INSTALLED channels, 1 through 21.

Some of the commands accept a shared user group list X. X is one or more alphabetic characters from A through H in a comma separated list.

The format of all of the commands is as follows:

COMMAND	DESCRIPTION
S A	show STATUS on ALL channels
S NN	show STATUS on a single channel
S NN-NN	show STATUS on a range of channels
E A	ENABLE ALL channels
E NN	ENABLE a single channel
E NN-NN	ENABLE a range of channels
D A	DISABLE ALL channels
D NN	DISABLE a single channel
D NN-NN	DISABLE a range of channels
P A	PROTECT ALL channels
P NN	PROTECT a single channel
P NN-NN	PROTECT a range of channels
U A	UNPROTECT ALL channels
U NN	UNPROTECT a single channel
U NN-NN	UNPROTECT a range of channels
G A	show GROUPS for ALL channels
G NN	show GROUPS for a single channel
G NN-NN	show GROUPS for a range of channels
G C	show GROUPS for the CRITICAL groups
A D A X	ADD a group list X to ALL channels in the DISPATCH group list
A D NN X	ADD a group list X to a single channel in the DISPATCH group list
A D NN-NN X	ADD a group list X to a range of channels in the DISPATCH group list
A I A X	ADD a group list X to ALL channels in the INTERCONNECT group list
A I NN X	ADD a group list X to a single channel in the INTERCONNECT group list
A I NN-NN X	ADD a group list X to a range of channels in the INTERCONNECT group list
A C X	ADD a group list X to the CRITICAL groups list
R D A X	REMOVE a group list X from ALL channels in the DISPATCH group list
R D NN X	REMOVE a group list X from a single channel in the DISPATCH group list
R D NN-NN X	REMOVE a group list X from a range of channels in the DISPATCH group list
R I A X	REMOVE a group list X from ALL channels in the INTERCONNECT group list
R I NN X	REMOVE a group list X from a single channel in the INTERCONNECT group list
R I NN-NN X	REMOVE a group list X from a range of channels from the INTERCONNECT group list
R C X	REMOVE a group list X from the CRITICAL groups list

An example of all of the CHAN commands follows:

GRD> CHAN

CHAN> S A

CHL	RIB/RTIB	TIB	TBIM	TRIB	ASSIGNED	TYPE	KEYED	PROTECT
1	ENAB	ENAB	ENAB	DIS	YES	CONTROL	YES	YES
2	ENAB	ENAB	ENAB	ENAB	YES	VOICE	YES	NO
3	ENAB	ENAB	ENAB	ENAB	YES	DATA	YES	NO
4	ENAB	ENAB	ENAB	ENAB	YES	BSI	YES	NO
5	SMT DIS	SMT DIS	ENAB	DIS	NO			NO
6	DIAG	DIAG	DIAG	DIS	NO			NO
7	MALF	SW DIS	MALF	DIS	NO			NO
8	ENAB	SW DIS	DIS	ENAB	NO			NO
9	SW DIS	SW DIS	DIS	DIS	NO			NO

CHAN> S 2

CHL	RIB/RTIB	TIB	TBIM	TRIB	ASSIGNED	TYPE	KEYED	PROTECT
2	ENAB	ENAB	ENAB	ENAB	YES	VOICE	YES	NO

CHAN> S 3-6

CHL	RIB/RTIB	TIB	TBIM	TRIB	ASSIGNED	TYPE	KEYED	PROTECT
3	ENAB	ENAB	ENAB	ENAB	YES	DATA	YES	NO
4	ENAB	ENAB	ENAB	ENAB	YES	BSI	YES	NO
5	SMT DIS	SMT DIS	ENAB	DIS	NO			NO
6	DIAG	DIAG	DIAG	DIS	NO			NO

CHAN> D 2

CHAN> S 2

CHL	RIB/RTIB	TIB	TBIM	TRIB	ASSIGNED	TYPE	KEYED	PROTECT
2	SMT DIS	SMT DIS	ENAB	ENAB	NO			NO

CHAN> E 5

CHAN> S 5

CHL	RIB/RTIB	TIB	TBIM	TRIB	ASSIGNED	TYPE	KEYED	PROTECT
5	ENAB	ENAB	ENAB	DIS	NO	VOICE	NO	NO

CHAN> P A

ARE YOU SURE (Y/N)? Y

CHAN> U 6-8

ARE YOU SURE (Y/N)? Y

CHAN> S A

CHL	RIB/RTIB	TIB	TBIM	TRIB	ASSIGNED	TYPE	KEYED	PROTECT
1	ENAB	ENAB	ENAB	DIS	YES	CONTROL	YES	YES
2	ENAB	ENAB	ENAB	ENAB	YES	VOICE	YES	YES
3	ENAB	ENAB	ENAB	ENAB	YES	DATA	YES	NO
4	ENAB	ENAB	ENAB	ENAB	YES	BSI	YES	YES
5	SMT DIS	SMT DIS	ENAB	DIS	NO			YES
6	DIAG	DIAG	DIAG	DIS	NO			NO
7	MALF	SW DIS	MALF	DIS	NO			NO
8	ENAB	SW DIS	DIS	ENAB	NO			NO
9	SW DIS	SW DIS	DIS	DIS	NO			YES

CHAN> G A

CHL	DISPATCH	INTERCONNECT	IN SERVICE
1	A B C D E F G H	A B C D E F G H	CONTROL
2	A B C D E F G H	A B C D E F G H	YES
3	A B C D E F G H	A B C D E F G H	YES
4	A B C D E F G H	A B C D E F G H	BSI
5	A B C D E F G H	A B C D E F G H	NO
6	A B C D E F G H	A B C D E F G H	NO
7	A B C D E F G H	A B C D E F G H	NO
8	A B C D E F G H	A B C D E F G H	NO
9	A B C D E F G H	A B C D E F G H	NO

CHAN> G 5

CHL	DISPATCH	INTERCONNECT	IN SERVICE
5	A B C D E F G H	A B C D E F G H	NO

CHAN> G 3-7		
CHL	DISPATCH	INTERCONNECT
3	A B C D E F G H	A B C D E F G H
4	A B C D E F G H	A B C D E F G H
5	A B C D E F G H	A B C D E F G H
6	A B C D E F G H	A B C D E F G H
7	A B C D E F G H	A B C D E F G H
		IN SERVICE
		YES
		BSI
		NO
		NO

CHAN> R D A C,D,E,F,G,H
ARE YOU SURE (Y/N)? Y

CHAN> R I 4 G,H,E

CHAN> G A		
CHL	DISPATCH	INTERCONNECT
1	A B - - - - -	A B C D E F G H
2	A B - - - - -	A B C D E F G H
3	A B - - - - -	A B C D E F G H
4	A B - - - - -	A B C D - F - -
5	A B - - - - -	A B C D E F G H
6	A B - - - - -	A B C D E F G H
7	A B - - - - -	A B C D E F G H
8	A B - - - - -	A B C D E F G H
9	A B - - - - -	A B C D E F G H
		IN SERVICE
		CONTROL
		YES
		YES
		YES
		YES
		NO
		NO
		NO

CHAN> R D 4-9 A,B
ARE YOU SURE (Y/N)? Y

CHAN> G A		
CHL	DISPATCH	INTERCONNECT
1	A B - - - - -	A B C D E F G H
2	A B - - - - -	A B C D E F G H
3	A B - - - - -	A B C D E F G H
4	- - - - -	A B C D - F - -
5	- - - - -	A B C D E F G H
6	- - - - -	A B C D E F G H
7	- - - - -	A B C D E F G H
8	- - - - -	A B C D E F G H
9	- - - - -	A B C D E F G H
		IN SERVICE
		CONTROL
		YES
		YES
		YES
		YES
		NO
		NO
		NO

CHAN> A D 4-7 C,D,E,F
ARE YOU SURE (Y/N)? Y

CHAN> A D 8-9 G,H
ARE YOU SURE (Y/N)? Y

CHAN> G A		
CHL	DISPATCH	INTERCONNECT
1	A B - - - - -	A B C D E F G H
2	A B - - - - -	A B C D E F G H
3	A B - - - - -	A B C D E F G H
4	- - C D E F - -	A B C D - F - -
5	- - C D E F - -	A B C D E F G H
6	- - C D E F - -	A B C D E F G H
7	- - C D E F - -	A B C D E F G H
8	- - - - - G H	A B C D E F G H
9	- - - - - G H	A B C D E F G H
		IN SERVICE
		CONTROL
		YES
		YES
		YES
		YES
		NO
		NO
		NO

CHAN> G C
CRITICAL SHARED USER GROUPS
- - - - -

CHAN> A C G,H,B,E
ARE YOU SURE (Y/N)? Y

CHAN> G C
CRITICAL SHARED USER GROUPS
- B - - E - G H

CHAN> R C E
ARE YOU SURE (Y/N)? Y

CHAN> G C
CRITICAL SHARED USER GROUPS
- B - - - - G H

ENAB = The current status of this device is enabled.
SW DIS = The current status of this device is switch disabled.
SMT DIS = The current status of this device is systems manager disabled.
DIAG = The current status of this device is testing.
MALF = The current status of this device is malfunction.
DIS = The current status of this device is disabled.

* NOTE that only a RIB and TIB can be enabled and disabled from the systems manager terminal.

If a TIB or RIB is currently disabled from the front panel and the systems manager terminal invokes an enable request, the request does NOT override the switch position.

If a TIB or RIB is currently disabled from the Systems Manager Terminal and the front panel switch is cycled from disabled to enabled, the switch position does NOT override the Systems Manager Terminal.

If there is a call currently going on and a disable request is received by the CSC, the CSC ends the call within 1 minute or when carrier is no longer received, whichever comes first.

If the system is installed without an interconnect unit (MCB or ICU), the TRIB status is blank.

If the system is installed without a console (TCI), the TBIM status is blank.

3.3.1 Protecting And Unprotecting a Channel

Protecting a channel is marking the channel so that the central will make it a last choice for servicing a call request. The central will only select a protected channel if all other unprotected channels that could satisfy the request are busy. Channels could be protected for one of the following reasons: to limit the impact of interference on certain channels, keeping a paging channel as free as possible, or, keeping a secure equipment channel as free as possible, and so on.

Unprotecting a channel means removing the protected status of a channel.

3.3.2 Shared User System Design

The concept behind Shared User is to allow the system management a means of control. Whereby individual units and talk groups may be directed, or steered, to certain channels. For this purpose, all individuals and talk groups are designated as part of a larger group called a Shared User group. The 8 Shared User groups are designated A-H and assignment of units to a Shared User group is done via the SAC command (See the SAC command description in Section 3.8). Shared User groups are then assigned to channels using the Add and Remove commands under the CHAN command processor.

While the Shared User commands allow the System Manager to assign units to Shared User groups and Shared User groups to channels in an almost limitless number of arrangements, care must be exercised to avoid compromising the efficiency of the trunked system and degrading service to the users. In general, the Share User feature should only be used to steer call requests when there is some restriction on channel usage, such as public safety band channels on a SMR system, or when it is necessary to direct some subset of users to a channel or set of channels with special capabilities, such as secure voice or data (Note: Type II radios can be steered to a secure channel by the call request type without Share User.) Shared User should NOT be used merely to provide a group of users with their own channels for the purpose of call privacy, since call reception is already limited to the transmitting unit's talk group, and doing so would destroy the efficiency inherent in a trunked system where channels are shared by many groups. If it is necessary to improve the grade of service to a particular set of users, this should be done using the priority levels adjustable through the SAC command. When the system is busy and call requests must wait to be assigned a channel, a unit with a higher priority will be the first request assigned when a channel becomes available.

Below is an example of how a System Manager might set up a Shared User system. Assume that there will be two Shared User groups; fleets 600 and 700 (Type I IDs) will be in one group and all other fleets will be in the second group. To set fleets 600 and 700 to Shared User group B, the System Manager would use the following commands at the SAC> prompt (see Section 3.8):

SAC> EDIT 600;SHU=B (Set all fleet 600 individuals to Shared User group B)

SAC> EDIT 600 S;SHU=B (Set all fleet 600 subfleets to Shared User group B)

SAC> EDIT 700;SHU=B (Set all fleet 700 individuals to Shared User group B)

SAC> EDIT 700 S;SHU=B (Set all fleet 700 subfleets to Shared User group B)

Default for all records is Shared User group A, so the rest of the records should still be set to A.

Second, assume we wish to have Shared User group A use channels 1-7, and Shared User group B use channels 5-10. To set this up, the System Manager would type the following commands at the CHAN> prompt (default for the group table is A,B,C,D,E,F,G,H):

CHAN> R D A C,D,E,F,G,H (Remove unused groups from all dispatch channels)

CHAN> R D 1-4 B (Remove group B from dispatch channels 1-4)

CHAN> R D 8-10 A (Remove group A from channels 8-10)

Now a "G A" (Groups A11) command would show the following:

CHAN> G A

CHL #	DISPATCH	INTERCONNECT	IN SERVICE
1	A	A B C D E F G H	YES
2	A	A B C D E F G H	CONTROL
3	A	A B C D E F G H	YES
4	A	A B C D E F G H	YES
5	A B	A B C D E F G H	YES
6	A B	A B C D E F G H	YES
7	A B	A B C D E F G H	YES
8	B	A B C D E F G H	YES
9	B	A B C D E F G H	YES
10	B	A B C D E F G H	YES

The interconnect table can be set up in a similar fashion.

Now, under normal operation, requests from Shared User group A (all users except fleets 600 and 700) will be directed first to channels 1-4 and second to channels 5-7 if 1-4 are busy. Likewise, requests from Shared User group B will be assigned first to channels 8-10 and second to channels 5-7 if 8-10 are busy.

Critical Group - A Shared User group should be designated as "critical" if it is important that the group get service even if all its normally usable channels should fail or be disabled. In such a case, the critical Shared User group would be allowed to use ANY channel that will support the call. Notice that this will NOT occur if a critical user group's channels are busy, since there would be channels that could be used by that group. Group members would still have to wait in the busy queue as if no critical groups were set. Critical group designation can only ensure that a Shared User group will get service if all of its usual channels are out of service. Proper assignment of Shared User groups to channels and maintenance of channels should prevent this from occurring.

Emergency Calls - Top-of-queue and ruthless preemption call processing - If an emergency call request cannot find a free channel within its own Shared User group, and the system is operating in top-of-queue mode, the system will transmission trunk calls on all channels that the emergency request could use. If the system is operating in ruthless preemption mode, the emergency request will only be allowed to preempt calls from its own Shared User group.

3.4 DATE COMMAND

The DATE command allows the system manager to query and/or modify the date and time of the system clock. Date and time are used by the system for diagnostics, alarm reporting and interconnect call processing and billing. The date format is:

DOW MM/DD/YR where DOW = day of week (SUNday-SATurday)
MM = month (01-12)
DD = day (01-31)
YR = year (00-99)

When the DATE command is completed, an automatic call to the TIME command is made. The format for the time is in 24 hour format as shown below:

HH:MM:SS where HH = hour (00-23)
MM = minute (00-59)
SS = second (00-59)

An example of how to use the DATE command follows:

```
GRD> date(cr)
CURRENT DATE (DOW MM/DD/YR) IS: SUNDAY 0/00/00
CORRECT (Y/N)? n(cr)
CHANGE DATE (DOW MM/DD/YR) TO: fri 10/16/87(cr)
CURRENT DATE (DOW MM/DD/YR) IS: FRIDAY 10/16/87
CORRECT (Y/N)? y(cr)
CURRENT TIME (HH:MM:SS) IS: 3:45:04
CORRECT (Y/N)? n(cr)
CHANGE TIME (HH:MM:SS) TO: 9:50:20(cr)
CURRENT TIME (HH:MM:SS) IS: 9:50:20
CORRECT (Y/N)? y(cr)

GRD>
```

The day of the week specification is required for interconnect call processing purposes. A space is required between the day of the week and the month specifications.

3.5 DIAG COMMAND

The DIAG command controls how error messages are presented. If the mode is set to "MANUAL", messages are seen by calling the DIAG processor and using the PRINT command and purging error messages with the CLEAR command. If the mode is "AUTOMATIC", error messages appear automatically whenever the system manager terminal is connected to the trunked system. Following is a table listing all commands available:

Command	Section	Description
Automatic	3.5.1	Turn on automatic error message reporting system
Clear	3.5.2	Clear all error messages from memory
Manual	3.5.3	Turn off automatic error message reporting system
Print	3.5.4	Print stacked error messages
Quit	3.5.5	Exit to Guardian prompt GRN>

3.5.1 AUTOMATIC Command

This command turns on the automatic printing of error messages. Messages are printed when they occur, whether the system manager terminal is actually logged on or not. Example:

```
GRD> DIAG(cr)  
MANUAL DIAGNOSTICS  
  
DIAG> AUTO(cr)  
AUTOMATIC DIAGNOSTICS  
  
DIAG>
```

3.5.2 CLEAR Command

This command clears all error messages from memory. This command works in the mode where the automatic printing and purging of messages is not in effect (i.e., a "MANUAL" command was made earlier). The system asks if you are sure. Example:

```
GRD> DIAG(cr)  
MANUAL DIAGNOSTICS  
  
DIAG> CLEAR(cr)  
ARE YOU SURE (Y/N)? Y(cr)  
  
DIAG>
```

3.5.3 MANUAL Command

This command turns off the automatic mode of receiving error messages. After issuing this command, error messages are seen only when the PRINT command is given, and the messages are purged only when the CLEAR command is given. In the event the error message queue is full and a new message needs to be added, the oldest message in memory is purged to make room for the newest message. Example of command:

```
GRD> DIAG(cr)  
AUTOMATIC DIAGNOSTICS  
  
DIAG> MAN(cr)  
MANUAL DIAGNOSTICS  
  
DIAG>
```


3.5.4 PRINT Command

This command causes DIAG to print any stored messages that are found in memory. The printing is non-destructive, i.e., the messages can be printed over and over again, unless they are cleared with the CLEAR command. Example:

```
GRD> DIAG(cr)
MANUAL DIAGNOSTICS

DIAG> PRINT(cr)

*DIAG* 0:01:51 3/20/88 MA 00 CSC EO OF OA 08
*DIAG* 0:01:51 3/20/88 MA 00 CSC EO OF OE OF
*DIAG* 0:01:58 3/20/88 MA 00 CSC EO OF OE OE
*DIAG* 0:02:11 3/20/88 MA 00 ICU B8 04 00 19
*DIAG* 0:02:11 3/20/88 MA 00 ICU B8 04 00 1A
*DIAG* 0:02:11 3/20/88 MA 00 ICU B8 04 00 1B
*DIAG* 13:24:07 3/20/88 MA 00 CSC EO OF OE 14

DIAG> PRINT(cr)
*DIAG* 0:01:51 3/20/88 MA 00 CSC EO OF OA 08
*DIAG* 0:01:51 3/20/88 MA 00 CSC EO OF OE OF
*DIAG* 0:01:58 3/20/88 MA 00 CSC EO OF OE OE
*DIAG* 0:02:11 3/20/88 MA 00 ICU B8 04 00 19
*DIAG* 0:02:11 3/20/88 MA 00 ICU B8 04 00 1A
*DIAG* 0:02:11 3/20/88 MA 00 ICU B8 04 00 1B
*DIAG* 13:24:07 3/20/88 MA 00 CSC EO OF OE 14

DIAG> CLEAR(cr)
ARE YOU SURE (Y/N)? Y(cr)

DIAG> PRINT(cr)
NO MESSAGES
```

DIAG>

3.5.5 QUIT Command

The QUIT command is used to exit from DIAG. Issuing this command returns the user to the GRD> prompt.

```
GRD> DIAG(cr)
MANUAL DIAGNOSTICS

DIAG> QUIT(cr)

GRD>
```

3.6 PARM COMMAND

The optional PARM command provides the system manager with the ability to modify selective system time-out periods, within prescribed values. The command function has been enhanced to include specification of the number of consecutive assignments of a talk group to recent user queue. The parameters available for modification are:

- Carrier Time-Out Period - Determines the time period for which an assigned voice channel remains unmuted and active, receiving only carrier and no handshake connect tones. After the time-out expires, the channel assumes the disconnect phase. The timer can be activated after disconnect tone is detected by the central controller.
- Fade Time-Out Period - Determines the time period for which an assigned voice channel remains active, even though no tones or carrier are received. After the time-out expires, the channel is deassigned. Timer is activated after the central controller fails to detect disconnect tone after loss of the low speed connect tone.
- Message Trunk Time-Out Period - Determines the time period for which a voice channel remains active after receiving disconnect from the subscriber unit (repeater dropout time). After the time-out expires, the channel is deassigned.
- Carrier Malfunction Time-Out Period - Determines how long an interfering carrier must be present on an deassigned channel before that channel is removed from system use. An entry of 254 seconds disables the time-out.

- Recent User Assignments - Defines the maximum number of consecutive assignments of a talk group to the high priority recent user queue. This number can be adjusted to achieve an acceptable balance between message continuity and the monopolization of the system by a large user group.
- Link timeout to remote site - Determines the time period the DCB waits before malfunctioning a remote site. This applies only to a wide area systems.
- Minimum Failsoft Time - Determines the time period the System stays in failsoft after all conditions have been met for Trunking.

The LIST command is used to examine the various parameters. A parameter is changed by entering the command (Carr, Fade, Trnk, Malf, Recent, Link, or MFST) followed by a space and the new number specification and a (cr).

The PARM command family is exited by entering QUIT command followed by a (cr).

COMMAND	PARAMETER	RANGE	FACTORY SET
C	Carrier	0.1 - 6.3	0.5 seconds
F	Fade	0.1 - 6.3	1.2 seconds
T	Message Trunk	0.1 - 6.3	1.0 seconds
MA	Carrier Malfunction	1 - 253	50 seconds
R	Recent User	0 - 255	2 assignments
LIN	Link	15 - 99	15 seconds
MF	Minimum Failsoft Time	0:10 - 25:00	0:30 seconds

An example of how to use the PARM command follows:

```

GRD> PARM(cr)
PARM> LIST(cr)
CARR T.O. = 0.5
FADE T.O. = 1.2
TRNK T.O. = 1.0
MALF T.O. = 50
RECENT = 2
LINK T.O. = 15
MFST = 0:30

PARM> C 1.0(cr)
PARM> T 2.0(cr)
PARM> R 5(cr)
PARM> MF 0:10(cr)
PARM> LINK 20(cr)
PARM> LIST(cr)
CARR T.O. = 1.0
FADE T.O. = 1.2
TRNK T.O. = 2.0
MALF T.O. = 50
RECENT = 5
LINK T.O. = 20
MFST = 0:10

PARM> Q(cr)
GRD>

```

3.7 PASSWORD COMMAND

After a user logs on to the system, the user can change the password on that account. In the case of the MASTER logon only, passwords can be removed or changed for all logons.

To access the password command, type "PASS" at the GRD> prompt. To prevent an unauthorized individual from walking up to a logged in terminal and changing the password for the account, the current password for the account is requested. After this is entered and verified, you will be prompted for the new password. This new password can be composed of 4 to 8 upper or lower case alpha characters, numbers and the special characters that appear normally in the upper case number positions on most keyboards. Punctuation and control characters are not permitted. If the syntax requirements are passed, you will then be asked for the password again. The 2 password inputs will be compared, and if the same, this will become the new password.

Passwords will not be displayed to the system manager terminal. Note that the password is case sensitive, so if you change the password using lower case characters, it must always be entered the same way, namely, in lower case.

If the PASS command is issued by the MASTER logon, the user is prompted for the logon to be changed. One of the four valid logons should be entered. Then the system prompts for the passwords. Also, the MASTER logon alone can disable the password for any of the logons by changing the password for that logon to "NULL" (this must be in upper case). (Note: the password for SYSTEM logon applies also to the SYSTxxx logon.) Following is a sample session:

If the user is logged on as BILLING, CONTROL, SYSTEM or SYSTxxx, :

```
GRD> PASS(cr)
ENTER CURRENT PASSWORD: TRUNKING(cr)      (not displayed on terminal)
ENTER NEW PASSWORD: MOUNTAIN(cr)          (not displayed on terminal)
ENTER AGAIN: MOUNTIAN(cr)                (not displayed on terminal)
PASSWORDS NOT THE SAME
CHANGE ABORTED

GRD> PASS(cr)
ENTER CURRENT PASSWORD: TRUNKING(cr)      (not displayed on terminal)
ENTER NEW PASSWORD: ABC(cr)               (not displayed on terminal)
PASSWORD TOO SHORT, MUST BE > 3 CHAR
CHANGE ABORTED

GRD> PASS(cr)
ENTER CURRENT PASSWORD: TRUNKING(cr)      (not displayed on terminal)
ENTER NEW PASSWORD: WEDNESDAY(cr)         (not displayed on terminal)
PASSWORD TOO LONG, MUST BE < 9 CHAR
CHANGE ABORTED

GRD> PASS(cr)
ENTER CURRENT PASSWORD: TRUNKING(cr)      (not displayed on terminal)
ENTER NEW PASSWORD: MOUNTAIN(cr)          (not displayed on terminal)
ENTER AGAIN: MOUNTAIN(cr)                (not displayed on terminal)
PASSWORD CHANGED
```

If the user logged on with the MASTER logon:

```
GRD> PASS(cr)
ENTER CURRENT PASSWORD: $MASTERS$(cr)     (not displayed on terminal)
ID TO BE CHANGED: SYSTEM(cr)
ENTER NEW PASSWORD: NULL(cr)              (not displayed on terminal)
ENTER AGAIN: NULL(cr)                    (not displayed on terminal)
PASSWORD REMOVED

GRD> PASS(cr)
ENTER CURRENT PASSWORD: $MASTERS$(cr)     (not displayed on terminal)
ID TO BE CHANGED: BILLING(cr)
ENTER NEW PASSWORD: CHEESE(cr)            (not displayed on terminal)
ENTER AGAIN: CHEESE(cr)                  (not displayed on terminal)
PASSWORD CHANGED

GRD> PASS(cr)
ENTER CURRENT PASSWORD: $MASTERS$(cr)     (not displayed on terminal)
ID TO BE CHANGED: MASTER(cr)
ENTER NEW PASSWORD: ham&eggs(cr)          (not displayed on terminal)
ENTER AGAIN: ham&eggs(cr)                (not displayed on terminal)
PASSWORD CHANGED

GRD>
```

In order to afford the highest level of security, the password is not kept in memory in a readable form. Once the password is established and verified, it is then processed by a one-way algorithm to produce a bit pattern that is then stored in memory. It is then compared later to logon passwords entered after these passwords have been processed. If the bit patterns match, the password entered is accepted. If they do not match, then the user is not allowed access to the system.

If the user forgets the password, it cannot be retrieved from memory. The MASTER logon can change the password, but cannot determine what the current password was. If the MASTER logon password is forgotten, that account can no longer be accessed unless the system is powered down and battery backed RAM erased by pulling the battery jumper (JUVB+).

Even though the MASTER logon password may be lost, all other logons can still be used as long as the passwords for those accounts are known.

An explanation of the command messages follows.

The following messages are displayed to the system manager as prompts or when an error is detected in the information being given to the system.

- **CHANGE ABORTED** - The password was not changed. The reason for the abort is listed on the previous line.
- **ENTER AGAIN:** - Enter the new password a second time. This verifies that the new password entered is what is intended. This is necessary since the password entered is not displayed.
- **ENTER CURRENT PASSWORD:** - Enter the current password for the logon you logged into. This is requested so that an unauthorized individual cannot walk up to an unprotected terminal and change the password.
- **ENTER NEW PASSWORD:** - Enter the new password you want.
- **ID TO BE CHANGED:** - "MASTER" logon is performing the PASS command. Enter the logon ID that is to have its password changed: "BILLING", "CONTROL", "MASTER" or "SYSTEM".
- **ONLY MASTER CAN USE "NULL"** - A user who is not logged in as "MASTER" attempted to remove the password.
- **PASSWORD CANNOT HAVE CONTROL CHAR** - The new password entered contains an illegal character. Perform the PASS command again.
- **PASSWORD CHANGED** - The password has been changed.
- **PASSWORD NOT MATCHED** - The password entered for verification is not the proper password for the logon ID used. Perform the PASS command again.
- **PASSWORD REMOVED** - The password has been removed from the logon.
- **PASSWORD TOO LONG, MUST BE < 9 CHAR** - The new password entered is too long. It must be 4 to 8 characters in length. Perform the PASS command again.
- **PASSWORD TOO SHORT, MUST BE > 3 CHAR** - The new password entered is too short. It must be 4 to 8 characters in length. Perform the PASS command again.
- **PASSWORDS CORRUPTED, SET TO DEFAULTS** - The system has determined that the passwords have been corrupted. The default passwords are now in effect.
- **PASSWORDS NOT THE SAME** - The two entries of the new password did not agree. Perform the PASS command again.
- **SYSTEM ERROR** - The system has made an error and cannot determine who is logged into the system. The user will be logged off and will have to log in again before the PASS command can be executed.

- **DRAM MALFUNCTION IN PASSWORDS** - The dynamic RAM in which the passwords reside was found to be bad. This RAM should be checked immediately, and, replaced if necessary. No passwords are allowed to be changed until the error is corrected.

3.8 SAC COMMAND - SUBSCRIBER ACCESS CONTROL

3.8.1 The User Records With The *SMARTNET II* ID Scheme

The user data base consists mainly of two types of records, talk group and individual. Each record specifies attributes for an individual or talk group telling how a unit may use the system.

The ID scheme consists of Type I and Type II IDs. Following is a description of the ID structure for the *Smartnet II* protocol.

TYPE I IDs:

The ID scheme for Type I IDs in a *Smartnet II* system remains the same as *Smartnet I* systems. That is, we continue to use the hexadecimal fleet-subfleet-individual convention. Individual IDs are referenced by a 3 digit hexadecimal fleet number, ranging from 000 to 77F, followed by a 3 digit hexadecimal individual number, ranging from 000 to FFE. Subfleets are also referenced by the same fleet number followed by a 2 digit hexadecimal subfleet number, ranging from 00 to 0F. All the aforementioned ranges are dependent upon the size code.

When the subfleet ID is entered at the System Manager's Terminal, the subfleet portion must be preceded with an "S" to distinguish it from the individual ID.

Examples:

705	001	(fleet 705, individual 1)
10F	30F	(fleet 10F, individual 30F)
405	S01	(fleet 405, subfleet 1)
600	S0A	(fleet 600, subfleet A)

TYPE II IDs:

The Type II ID is referenced with a 6 digit decimal number. This number is the same as the Type II land-to-mobile interconnect and Private Call II IDs.

Individual IDs must begin with a "7" followed by 5 decimal digits ranging from 00001 to 65534. These 5 digits are a direct decimal conversion of the 4 digit hexadecimal ID. Talk group IDs must begin with an "8" followed by 5 decimal digits ranging from 00001 to 04094. Once again, these 5 digits are a direct decimal conversion of the 3 digit hexadecimal talk group ID.

When a Type II ID is entered at the System Manager Terminal's "SAC" command, it must be preceded by an "I" or "T", for individual or talk group, respectively. This is to distinguish Type I and Type II IDs.

Examples:

I705001	(individual 5001)
I700235	(individual 235)
T800001	(talk group 1)
T800300	(talk group 300)

Examples 1 and 2 show both Type I and Type II individual and talk group records, respectively.

3.8.1.1 - INDIVIDUAL ATTRIBUTES

This is a description of the attributes that are listed in an individual subscriber record.

Example 1: Type I Individual:

Individual:

FLT	UNT	ENA	EP2	FIX	AMS	PRL	SYW	MGC	TGW	PVC	INT	DRG	PAG	DAT	SEC	SHU
400	001	Y	Y	N	N	3	N	Y	Y	N	Y	Y	N	N	N	A

Talk group:

FLT	SUBFLT	ENA	MFL	PMG	AMS	PRL	PR2	PTI	SEC	SHU
001	01	Y	N	N	N	8	N	N	N	A

Example 2: Type II

Individual:

UNIT	ENA	EP2	FIX	AMS	PRL	SYW	MGC	TGW	PVC	INT	DRG	PAG	DAT	SEC	SHU
I700123	Y	Y	N	N	3	N	Y	Y	N	Y	Y	N	N	N	A

Talk group:

TALK GRP	ENA	MFL	PMG	AMS	PRL	PR2	PTI	SEC	SHU
T800001	Y	N	N	N	8	N	N	N	A

- ENA - (Enable) - Y indicates that the individual is allowed to use the system when the Subscriber function is active. The system uses the default records when the Subscriber function is inactive.
- EP2 - (Enhanced Protocol IIi) - Y indicates that the individual does not perform high speed handshake. For Type II units, this flag will always be set, and, cannot be modified since these units never perform high speed handshaking.
- FIX - (Fixed Location) - Y indicates that the individual has a fixed location, such as a console. N indicates that the individual has a mobile location.
- AMS - (Automatic Multiple Site Switching) - Y indicates that an individual is allowed to make a wide area (AMSS) call. This feature is used only from the RCSC when there are wide and local channels.
- PRL - (Priority Level) - Priority levels can be set (2-8) to be used in assigning system resources to the unit. In the case where the unit and talk group have different priorities, the central controller will use the higher priority (lower number). Priority applies to both dispatch and interconnect calls.
- SYW - (System Wide) - Y indicates the unit is allowed to make a system wide call. The unit must be equipped with the system wide call option.
- MGC - (Multi-Group Call) - Y indicates that the unit is allowed to make multi-group (fleet-wide/announcement) calls.
- TGW - (Talk Group Wide) - Y indicates that the unit is allowed to make a talk group wide call.
- PVC - (Private Call) - Y indicates the unit is allowed to make a private call. The unit must be equipped with one of the private call options.
- INT - (Interconnect Call) - Y indicates the unit is allowed to make a telephone interconnect call. The unit must be capable of making an interconnect call, and must be on the authorization list if it is active.
- DRG - (Dynamic Regrouping) - Y indicates that the unit is allowed to initiate dynamic regrouping commands (open gateway).
- PAG - (Paging Request) - Y indicates that the unit is allowed to make a paging request.
- DAT - (Data Request) - Y indicates that the unit is allowed to make a data request.

- SEC - (Secure Communications) - N (Normal) indicates that the talk group is allowed to make clear (non-coded) calls only. S (Secure) indicates that the talk group can make secure (coded) calls only. B (Both) indicates that the talk group is allowed to make both clear and secure calls.
- SHU - (Shared User) - Individual users are grouped into one of eight shared user groups (A-H).

All the options are followed by an equal sign and the new value for that option. All options except for PRL, SEC, and SHU use the character "N" for NO and "Y" for YES. As described above, PRL uses numbers 2- 8, SEC uses letters N, S, and B, and, SHU uses letters A-H. The command and ID field are followed by a semicolon(;), then the option(s) and the new value(s). For example, the ID/option field I700123;ENA = Y,SYW = N,PRL = 6,INT = Y,SHU = C corresponds to Example 3.

Example 3:

UNIT	ENA	EP2	FIX	AMS	PRL	SYW	MGC	TGW	PVC	INT	DRG	PAG	DAT	SEC	SHU
I700123	Y	Y	N	N	6	N	N	Y	N	Y	N	N	N	N	C

Use of the option field is described in the sections for LIST and EDIT. If an "*" is specified in the option field, e.g., I700123;*, then the workspace record is filled with the default record, described in Section 3.8.1.3. Each position in the workspace may only be specified once, meaning that each option may only appear once.

3.8.1.2 - Talk Group Attributes

This is a description of the attributes that are listed in a talk group record.

- ENA - (Enable) - Y indicates that the talk group is allowed to use the system when the Subscriber function is active. The system uses the default records when the Subscriber function is inactive.
- MFL - (Mixed Fleet) - Y indicates that the fleet is mixed (contains Type I AND Type II IDs). N indicates Type I IDs only. This option is used for Type I fleet-subfleet records only, and, is only editable on a fleet basis.
- PMG - (Priority Monitor Group) - Y indicates that the talk group is a priority monitor group.
- AMS - (Automatic Multiple Site Switching) - Y indicates that a talk group is allowed to make a wide area (AMSS) call. This feature is used only from the RCSC when there are wide and local channels.
- PRL - (Priority Level) - Priority levels can be set (2-8) to be used in assigning system resources to the talk group. In the case where the unit and talk group have different priorities, the central controller uses the higher priority (lower number). Priority applies to both dispatch and interconnect calls.
- PR2 - (Normal/Tactical Priority Level) - Normal or Tactical priority levels can be set through a console in assigning system resources to the talk group. Y indicates that the talk group is set to tactical (priority level of 2). N indicates there is no tactical priority, and, the talk group is set back to its normal priority level. Normal/Tactical priority changes can only be made through a console, and, do not apply to the default record.
- PTI - (Push-To-Talk ID) - Y indicates that the talk group operates using PTT ID. This option is used for Type I fleet-subfleet records only, and, is only editable on a fleet basis.
- SEC - (Secure Communications) - N (Normal) indicates that the talk group is allowed to make clear (non-coded) calls only. S (Secure) indicates that the talk group can make secure (coded) calls only. B (Both) indicates that the talk group is allowed to make both clear and secure calls.
- SHU - (Shared User) - Talk group users are grouped into one of eight shared user groups (A-H).

All the options are followed by an equal sign and the new value for that option. All options except for PRL, SEC, and SHU use the character "N" for NO and "Y" for YES. As described above, PRL used numbers 2-8, SEC uses letters N, S, and B, and, SHU uses letters A-H. The command and ID field are followed by a semicolon(;), then the option(s) and the new value(s). For example, the ID/option field T800001;ENA = Y,PMG = N,PRL = 6,PTI = Y,SHU = C corresponds to Example 4.

Example 4:

TALK GRP	ENA	MFL	PMG	AMS	PRL	PR2	PTI	SEC	SHU
T800001	Y	N	N	N	6	N	Y	N	C

Use of the option field is described in the sections for LIST and EDIT. If an "*" is specified in the option field, e.g., T800001;*, then the workspace record is filled with the default record, described in Section 3.8.1.3. Each position in the workspace may only be specified once, meaning that each option may only appear once.

3.8.1.3 - THE DEFAULT RECORDS

If the data for a particular unit is lost, the system will replace the data with the appropriate default record. These records, one for individuals, and, one for talk groups, have the same format as the records shown in paragraphs 3.8.1.1 and 3.8.1.2. They can be operated on by specifying "I*" or "T*" instead of an individual or talk group ID. This allows the system manager to specify what grade of service a user will receive if his record is lost. It also allows the default records to be modified so they can be used with certain subscriber commands. (See command descriptions, paragraph 3.8.2).

IMPORTANT NOTE

When the system manager is finished working with the default records, they should be set so that an acceptable level of service is provided for any user whose record may be lost.

If the default records are lost, then the system replaces them with default records stored in the central controller code plug. The code plug default records are programmed in the factory.

3.8.2 - Subscriber Access Control Commands

Following is a table listing all commands available:

COMMAND	SECTION	DESCRIPTION
Options	3.8.2.1	List available options
Activate	3.8.2.2	Activate an individual subscriber unit
Deactivate	3.8.2.3	Deactivate an individual subscriber unit
Edit	3.8.2.4	Edit subscriber talk group records
List	3.8.2.5	List subscriber/talk group records
Stats	3.8.2.6	Show and change status
Clear	3.8.2.7	Set all records to codeplug defaults
Set	3.8.2.8	Set all records to defaults
Csave	3.8.2.9	Intelligent memory save
Cload	3.8.2.10	Intelligent memory reload
Quit	3.8.2.11	Exit to guardian prompt GRD>

3.8.2.1 - OPTIONS COMMAND

This command prints the abbreviations for the user attributes that the system manager is allowed to modify, along with their associated values that can be set. Example:

```
SAC> OPT
ENA = Y/N
EP2 = Y/N
FIX = Y/N
AMS = Y/N
PRL = 2-8
SYW = Y/N
MGC = Y/N
TGW = Y/N
PVC = Y/N
INT = Y/N
DRG = Y/N
```


PAG = Y/N
DAT = Y/N
SEC = S/N/B
SHU = A-H
MFL = Y/N
PMG = Y/N
PTI = Y/N

3.8.2.2 - ACTIVATE COMMAND

This command is used to put an individual in the active records list. When a record is activated, it gets the same attributes as the default record. For Type I, an individual or a fleet of individual records can be activated. An individual or range of individual IDs can also be activated for Type II.

For Type I, if an entire fleet is activated, or for Type II, if a range of individuals is activated, then the system asks "ARE YOU SURE (Y/N)?" before continuing.

The default record is set active by specifying "I*" instead of an individual ID.

Following are Type I and Type II examples.

```
SAC> ACT 001 3 (Type I)
SAC> ACT 112 (Type I)
ARE YOU SURE (Y/N)? Y
SAC> ACT I700123 (Type II)
SAC> ACT I700123-I700125 (Type II)
ARE YOU SURE (Y/N)? Y
SAC> ACT I*
```

3.8.2.3 - DEACTIVATE COMMAND

This command deactivates an individual record or a fleet of individual records for Type I or an individual record or a range of individual records for Type II. When a record has been deactivated, it can no longer be listed, modified or used until it is activated again. Once an individual record has been re-activated, it is replaced with the default record. Therefore, this command should not be used to temporarily deny service to a unit. The default record can be deactivated by specifying "I*", however, it can still be listed but not modified. Fleet-subfleet/talk group records cannot be deactivated since they are always considered active. DEACTIVATE also asks "ARE YOU SURE (Y/N)?" when an entire fleet is deactivated for Type I or a range of individuals is deactivated for Type II.

Following are Type I and Type II examples.

```
SAC> DEA 001 3 (Type I)
SAC> DEA 112 (Type I)
ARE YOU SURE (Y/N)? Y
SAC> DEA I700123 (Type II)
SAC> DEA I700123-I700125 (Type II)
ARE YOU SURE (Y/N)? Y
SAC> DEA I*
```

3.8.2.4 - EDIT COMMAND

The EDIT subcommand changes the SAC attributes for any individual record, fleet-subfleet/talk group record, individual default record, or fleet-subfleet/talk group default record. These records may be changed one at a time, by entire fleets for Type I, or by ranges of individuals or talk groups for Type II. The EDIT subcommand has two parts to its input field. The first part is the ID field as described at the beginning of 3.8.1. This ID field is followed by a semicolon and then the second part, the option field, which tells what attributes are to be changed. The attribute

names are those listed above in the OPTIONS subcommand. The names are followed by an equal sign and the desired setting. Valid settings are also shown in the OPTIONS subcommand. Default records may be modified by specifying "I*" for the individual or "T*" for the talk group record. After a single record is modified, the record is listed to confirm the change. If the EDIT is for an entire fleet in Type I, or a range of records in Type II, the system asks "ARE YOU SURE (Y/N)?" before proceeding. Individual records may only be modified if they are active. Refer to Example 5.

Example 5.

```
SAC> EDIT 400 1; INT=Y, PVC=N, PRL=3 (Type I)
FLT UNT ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
400 001 Y Y N N 3 N Y Y N Y Y N N A
```

```
SAC> EDIT 400; SYW=Y, PVC=Y (Type I)
ARE YOU SURE (Y/N)? Y
```

```
SAC> EDIT 001 S1; ENA=Y, PMG=N (Type I)
FLT SUBFLT ENA MFL PMG AMS PRL PR2 PTI SEC SHU
001 01 Y N N N 8 N N N A
```

```
SAC> EDIT 001 S; MFL=Y (Type I)
ARE YOU SURE (Y/N)? Y
```

```
SAC> EDIT I700123; INT=Y, PVC=N, PRL=3 (Type II)
UNIT ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
I700123 Y Y N N 3 N Y Y N Y Y N N A
```

```
SAC> EDIT I700123-I700129; SYW=Y, PVC=Y (Type II)
ARE YOU SURE (Y/N)? Y
```

```
SAC> EDIT T800001; ENA=Y, PMG=N (Type II)
TALK GRP ENA MFL PMG AMS PRL PR2 PTI SEC SHU
T800001 Y - N N 8 N - N A
```

```
SAC> EDIT T800001-T800008; MFL=Y (Type II)
ARE YOU SURE (Y/N)? Y
```

```
SAC> EDIT I*; MGC=Y
UNIT ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
I* Y Y N N 8 N Y Y Y Y Y N N A
```

```
SAC> EDIT T*; ENA=Y
TALK GRP ENA MFL PMG AMS PRL PR2 PTI SEC SHU
T* Y N N N 8 - N N A
```

3.8.2.5 - LIST COMMAND

The LIST subcommand displays any record or related group of records. Like the EDIT subcommand, LIST has two parts to its input field. If the ID field is blank, all the individual records are listed. If all individual records, an entire fleet for Type I, or a range of records for Type II is requested, the option field can specify that only records with certain attributes be listed. The option field has the same syntax as in the EDIT subcommand. Individual records may only be listed if they are active. The default records, both individual and fleet-subfleet/talk group, can be modified by specifying "I*" and "T*", respectively. If a list of all records is requested, a form feed character is sent before each 56 IDs. Typing control-X at any time stops a LIST command, and, returns the system to the SAC prompt. Refer to Example 6.

3.8.2.6 - STATS COMMAND

The STATS subcommand has a dual function. First, it always reports the state (active/inactive) of the SAC system and asks if it should be changed. Second, if any records have been lost and set to default, STATUS reports it by printing the lost IDs. Both Type I and Type II IDs are reported with the same command. If more than 255 records have been lost, STATUS reports "ALL SUBSCRIBER RECORDS HAVE BEEN SET TO DEFAULT" as shown in Example 7.

Example 6.

SAC> LIST 400 1 (Type I)
 FLT UNT ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
 400 001 Y Y N N 3 N Y Y Y Y Y Y N N N A

SAC> LIST 400 (Type I)
 FLT UNT ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
 400 000 N Y N N 8 N Y Y Y Y Y Y N N N A
 400 001 Y Y N N 3 N Y Y Y Y Y Y N N N A
 400 002 Y Y N N 8 N Y Y Y Y Y Y N N N A
 400 003 N Y N N 8 N Y Y Y Y Y Y N N N A
 400 004 N Y N N 8 N Y Y Y Y Y Y N N N A
 400 005 Y Y N N 8 N Y Y N Y Y Y N N N A
 400 006 Y Y N N 8 N Y Y Y Y Y Y N N N A
 400 007 Y Y N N 8 N Y Y N Y Y Y N N N A

SAC> LIST 400; ENA=Y, PVC=Y (Type I)
 FLT UNT ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
 400 002 Y Y N N 8 N Y Y Y Y Y Y N N N A
 400 006 Y Y N N 8 N Y Y Y Y Y Y N N N A

SAC> LIST 405 S; ENA=N (Type I)
 FLT SUBFLT ENA MFL PMG AMS PRL PR2 PTI SEC SHU
 405 01 N N N N 8 N N N N A
 405 04 N N N N 8 N N N N A
 405 0C N N N N 8 N N N N A

SAC> LIST I700123-I700129; INT=Y, FIX=N (Type II)
 UNIT ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
 I700123 Y Y N N 3 Y Y Y Y Y Y Y N N N A
 I700125 Y Y N N 8 Y Y Y Y Y Y Y N N N A
 I700128 Y Y N N 8 Y Y Y Y Y Y Y N N N A

SAC> LIST T800001 (Type II)
 TALK GRP ENA MFL PMG AMS PRL PR2 PTI SEC SHU
 T800001 Y - N N 8 Y - N A

SAC> LIST T800001-T800008; PMG=Y (Type II)
 TALK GRP ENA MFL PMG AMS PRL PR2 PTI SEC SHU
 T800002 Y - Y N 8 N - N A
 T800004 Y - Y N 8 N - N A
 T800005 Y - Y N 8 N - N A
 T800006 Y - Y N 8 N - N A

SAC> LIST I*
 UNIT ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
 I* Y Y N N 8 N Y Y Y Y Y Y N N N A

SAC> LIST T*
 TALK GRP ENA MFL PMG AMS PRL PR2 PTI SEC SHU
 T* Y N N N 8 - N N A

Example 7.

SAC>
 STATS THESE RECORDS HAVE BEEN SET TO DEFAULT:

T800260	T800261	T800262	T800263	T800264	T800265	T800266	T800267
400 S00	400 S01	400 S02	400 S03	400 S04	400 S05	400 S06	400 S07
I700800	I700801	I700802	I700803	I700804	I700805	I700806	I700807
604 008	604 009	604 00A	604 00B	604 00C	604 00D	604 00E	604 00F

SUBSCRIBER FUNCTION IS INACTIVE
 CHANGE TO ACTIVE (Y/N)? Y

SAC> STATS

SUBSCRIBER FUNCTION IS ACTIVE
 REMAIN ACTIVE (Y/N)? N

3.8.2.7 - CLEAR COMMAND

The CLEAR subcommand places all SAC records into a known state. When this subcommand is entered, the default values for subscriber records stored in the code plug are copied into the default records, these are copied into all SAC records. Once all records have been "cleared", the individual default record is activated and the SAC status is set to inactive. Refer to Example 8.

NOTE

The CLEAR command should be performed, followed by the SET command, after the CSC board has lost power for an extended period of time. This is because all subscriber records will have been lost, as reported by the STAT command, and, should be initialized to a known state.

Example 8:

```
SAC> CLEAR
ARE YOU SURE (Y/N)? Y
RECORDS CLEARED
SUBSCRIBER TURNED OFF
```

3.8.2.8 - SET COMMAND

The SET subcommand also places all SAC records into a known state. When this subcommand is entered, the default values for subscriber records are copied into all SAC records and the SAC status is set to inactive.

NOTE

The SET command should be performed, preceded by the CLEAR command, after the CSC board has lost power for an extended period of time. This is because all subscriber records will have been lost, as reported by the STAT command, and, should be initialized to a known state.

Example:

```
SAC> SET
ARE YOU SURE (Y/N)? Y
RECORDS SET
SUBSCRIBER TURNED OFF
```

3.8.2.9 - CSAVE COMMAND

The CSAVE command causes the central controller to send a copy of memory to a recording device. This command works similarly to the old SAVE command. The difference is that this command is used to save records to an intelligent device instead of to a tape machine. A System Manager's Terminal (SMT) node is needed on the intelligent end.

With the SAVE, if any record is received in error, a tape machine can only send a control-X to abort the download of data, then must start the process all over again. CSAVE allows an error free saving of data without the need for VERIFY or repeated attempts to save data.

3.8.2.10 - CLOAD COMMAND

The CLOAD command causes the central controller to read data from an intelligent storage device, check the data received, and, if valid, place this data into memory at the proper location. This command works similarly to the old LOAD command. The difference is that this command is used to load records from an intelligent device instead of from a tape machine. An SMT node is needed on the intelligent end.

With the LOAD, if any record is received in error, the central aborts the load. Then the process must be started all over again. CLOAD allows an error free loading of data without the need for repeated attempts to load the data. The subscriber function is set to inactive whenever the CLOAD subcommand is used.

3.8.2.11 - QUIT COMMAND

The QUIT command exits SAC, and, returns back to the GRD prompt.

3.8.3 Subscriber Record Error Detection and Correction

Within the subscriber software package are routines designed to detect errors in the subscriber data base. If a record is found to be bad, it is set to default and marked as lost. The system then sends the appropriate diagnostic message, stating that some data was lost. The system manager should then use the STATS command to see what records were lost so they can be corrected. The system keeps a count of lost records, and, if more than 255 have been lost, sends a diagnostic message stating that all records have been lost (or at least it is likely). In this case, the best thing to do is to reload the records from the optional backup device. The lost record count is cleared whenever the STATS command is run.

If the CSC board loses power for an extended period of time, all data is lost and the error correcting routine sends the corresponding diagnostic message. However, there is a small chance that the error correcting routine will not correct a block of memory, thinking it is already correct. For this reason, it is important to do a "CLEAR" or "SET" whenever an "ALL RECORDS LOST" message is received.

3.8.4 Subscriber Access Control Error Messages

The following messages are displayed to the system manager when an error is detected in the information being given to the system.

- **BAD INPUT** - A good ID field was found initially, but was followed by bad data.
- **CHECKSUM ERROR** - A checksum error was detected in the subscriber records. The requested operation was aborted and the error correcting routine was run.
- **INVALID OPTION** - An option was specified that was not included with the purchased option package.
- **INVALID TALK GROUP, INVALID INDIVIDUAL** - The indicated portion of the ID field was defective or value not in a valid range.
- **NO MATCHING RECORDS** - LIST could not find any records that matched the specified option list. If a single ID was specified, it was not active.
- **OPTIONS NOT ALLOWED** - ID field was followed by a semicolon in a command where options are not allowed.
- **OPTIONS ONLY ALLOWED ONCE** - An option number was specified more than once in an option field.
- **PRIORITY ONLY ALLOWED ONCE** - More than one priority number (2-8) was specified in an option field.
- **RECORD ALREADY ACTIVE** - The ACTIVE command was tried on an active record.
- **RECORD NOT ACTIVE** - A LIST or EDIT command was tried on an inactive record.
- **ID ERROR IN CODEPLUG** - Code plug is set up incorrectly for Type I and Type II ID ranges.
- **INVALID ID TYPE** - This ID does not fall within the valid range for the type of ID entered (Type I or Type II).
- **NUMBER OUT OF RANGE** - Number entered does not fall within valid limits.
- **INVALID DRAM PAGE** - ID went past end of code plug ID type partitioning table. This table may be set up improperly in the code plug.

3.8.5 Using Subscriber Access Control

There are two basic methods that can be used to control system access. The first way is to activate and enable all units on the system and then deny service to selected units by disabling them (this is known as "negative subscriber" method). Disabling rather than deactivating a unit leaves it in the subscriber list so it may be re-enabled without having to change its attributes. The other method is to activate and enable only those units that are allowed service (this is known as "positive subscriber" method).

Following are examples of setting up the subscriber data base for "positive" and "negative" subscriber systems. The actual sequence varies depending on the system requirements.

In either case, it should be remembered that the default record determines:

- 1) what kind of service a unit receives if its record is lost, and,
- 2) what level of service everyone receives if subscriber is deactivated.

Therefore, whenever the default record is modified, the system manager should be sure that it is left with an acceptable level of service.

Example 9. Positive Subscriber Example

```

GRD> SAC
SAC> CLEAR
ARE YOU SURE (Y/N)? Y
RECORDS CLEARED
SUBSCRIBER TURNED OFF

SAC> LI I*
UNIT   ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
I*      Y  N  N  N  8  N  Y  Y  Y  Y  Y  N  N  N  A

SAC> EDIT I*;PVC=N
UNIT   ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
I*      Y  N  N  N  8  N  Y  Y  N  Y  Y  N  N  N  A

SAC> LIST I*
UNIT   ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
I*      Y  N  N  N  8  N  Y  Y  N  Y  Y  N  N  N  A

SAC> DEA I*

SAC> SET
ARE YOU SURE (Y/N)? Y
RECORDS SET
SUBSCRIBER TURNED OFF

SAC> ACT I700123-I700140
ARE YOU SURE (Y/N)? Y

SAC> ACT I700800

SAC> ACT I700803

SAC> LIST I700800-I700805
UNIT   ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
I700800 Y  N  N  N  8  N  Y  Y  N  Y  Y  N  N  N  A
I700803 Y  N  N  N  8  N  Y  Y  N  Y  Y  N  N  N  A

SAC> EDIT I*;PVC=Y,INT=N
RECORD NOT ACTIVE

SAC> ACT I*

SAC> EDIT I*;PVC=Y,INT=N
UNIT   ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
I*      Y  N  N  N  8  N  Y  Y  Y  N  Y  N  N  N  A

```

Example 9. Positive Subscriber Example (Continued)

SAC> **ACT 1700260-1700270**
ARE YOU SURE (Y/N)? **Y**

SAC> **EDIT 1700267;ENA=Y**
UNIT ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
1700267 Y N N N 8 N Y Y Y N Y N N N A

SAC> **EDIT 1700268;SYW=Y**
UNIT ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
1700268 Y N N N 8 Y Y Y Y N Y N N N A

SAC> **EDIT 1700267-1700268;INT=Y**
ARE YOU SURE (Y/N)? **Y**

SAC> **EDIT T800001;ENA=Y**
TALK GRP ENA MFL PMG AMS PRL PR2 PTI SEC SHU
T800001 Y N N N 8 N Y N A

SAC> **LIST T800001-T800012**
TALK GRP ENA MFL PMG AMS PRL PR2 PTI SEC SHU
T800001 Y N N N 8 N Y N A
T800002 Y N N N 8 N Y N A
T800003 Y N N N 8 N Y N A
T800004 Y N N N 8 N Y N A
T800005 Y N N N 8 N Y N A
T800006 Y N N N 8 N Y N A
T800007 Y N N N 8 N Y N A
T800008 Y N N N 8 N Y N A

T800009 Y N N N 8 N Y N A
T800010 Y N N N 8 N Y N A
T800011 Y N N N 8 N Y N A
T800012 Y N N N 8 N Y N A

SAC> **STAT**
SUBSCRIBER FUNCTION IS INACTIVE
CHANGE TO ACTIVE? (Y/N) **Y**

SAC>

NOTES ON POSITIVE SUBSCRIBER (EXAMPLE 9)

COMMAND	DESCRIPTION
CLEAR	Initializes the subscriber records before they are first entered. Do this only the first time that any records are entered
LI I*	List unit default record
EDIT I*;PVC=N	Disable private call in the default record. Note: The default record is used when a unit is activated
LIST I*	List unit default record
DEA I*	Deactivate the default record
SET	Move the default record into all subscriber records
ACT I700123-I700140	Activate units I700123 through I700140
ACT I700800	Activate unit I700800
ACT I700803	Activate unit I700803
LIST I700800-I700805	List units I700800 thru I700805 inclusive
EDIT I*;PVC = Y,INT = N	Enable private call and disable interconnect in the default record
ACT I*	Activate the default record
EDIT I*;PVC = Y,INT = N	Enable Private Call, Disable interconnect. The default record is used when a unit is activated
ACT I700260-I700270	Activate units I700260 through I700270
EDIT I700267;ENA = Y	Edit unit I700267, enable the unit
EDIT I700268;SYW = Y	Edit unit I700268, allow system-wide calls
EDIT I700267-I700268	Edit units 0007 & 0008, allow interconnect
EDIT T800001;ENA = Y	Edit talk group T800001, enable the talk group
LIST T800001-T800012	List talk groups T800001 through T800012
STAT	Turn subscriber function ON or OFF

Example 10. Negative Subscriber

```

GRD> SAC

SAC> CLEAR
ARE YOU SURE (Y/N)? Y
RECORDS CLEARED
SUBSCRIBER TURNED OFF

SAC> LI I*
UNIT   ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
I*      Y  N  N  N  N  8  N  Y  Y  Y  Y  Y  N  N  N  A

SAC> EDIT I*;MGC=N,PVC=N
UNIT   ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
I*      Y  N  N  N  N  8  N  N  Y  N  Y  Y  N  N  N  A

SAC> LI T*
TALK GRP ENA MFL PMG AMS PRL PR2 PTI SEC SHU
T*      Y  N  N  N  N  8  -  Y  N  A

SAC> SET
ARE YOU SURE (Y/N)? Y
RECORDS SET
SUBSCRIBER TURNED OFF

SAC> LIST I700800-I700809
UNIT   ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
I700800 Y  N  N  N  N  8  N  N  Y  N  Y  Y  N  N  N  A
I700801 Y  N  N  N  N  8  N  N  Y  N  Y  Y  N  N  N  A
I700802 Y  N  N  N  N  8  N  N  Y  N  Y  Y  N  N  N  A
I700803 Y  N  N  N  N  8  N  N  Y  N  Y  Y  N  N  N  A
I700804 Y  N  N  N  N  8  N  N  Y  N  Y  Y  N  N  N  A
I700805 Y  N  N  N  N  8  N  N  Y  N  Y  Y  N  N  N  A
I700806 Y  N  N  N  N  8  N  N  Y  N  Y  Y  N  N  N  A
I700807 Y  N  N  N  N  8  N  N  Y  N  Y  Y  N  N  N  A

I700808 Y  N  N  N  N  8  N  N  Y  N  Y  Y  N  N  N  A
I700809 Y  N  N  N  N  8  N  N  Y  N  Y  Y  N  N  N  A

SAC> EDIT I700123-I700140;ENA=N
ARE YOU SURE (Y/N)? Y

SAC> EDIT I700800;ENA=N
UNIT   ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
I700800 N  N  N  N  N  8  N  N  Y  N  Y  Y  N  N  N  A

SAC> EDIT I700809;ENA=N
UNIT   ENA EP2 FIX AMS PRL SYW MGC TGW PVC INT DRG PAG DAT SEC SHU
I700809 N  N  N  N  N  8  N  N  Y  N  Y  Y  N  N  N  A

```

Example 10. Negative Subscriber (Continued)

SAC> LIST I700800-I700809															
UNIT	ENA	EP2	FIX	AMS	PRL	SYW	MGC	TGW	PVC	INT	DRG	PAG	DAT	SEC	SHU
I700800	N	N	N	N	8	N	N	Y	N	Y	Y	N	N	N	A
I700801	Y	N	N	N	8	N	N	Y	N	Y	Y	N	N	N	A
I700802	Y	N	N	N	8	N	N	Y	N	Y	Y	N	N	N	A
I700803	Y	N	N	N	8	N	N	Y	N	Y	Y	N	N	N	A
I700804	Y	N	N	N	8	N	N	Y	N	Y	Y	N	N	N	A
I700805	Y	N	N	N	8	N	N	Y	N	Y	Y	N	N	N	A
I700806	Y	N	N	N	8	N	N	Y	N	Y	Y	N	N	N	A
I700807	Y	N	N	N	8	N	N	Y	N	Y	Y	N	N	N	A
I700808	Y	N	N	N	8	N	N	Y	N	Y	Y	N	N	N	A
I700809	N	N	N	N	8	N	N	Y	N	Y	Y	N	N	N	A
SAC> LI I*															
UNIT	ENA	EP2	FIX	AMS	PRL	SYW	MGC	TGW	PVC	INT	DRG	PAG	DAT	SEC	SHU
I*	Y	N	N	N	8	N	N	Y	N	Y	Y	N	N	N	A
SAC> STAT															
SUBSCRIBER FUNCTION IS INACTIVE															
CHANGE TO ACTIVE? (Y/N) Y															
SAC>															

NOTES ON NEGATIVE SUBSCRIBER (EXAMPLE 10)

COMMAND	DESCRIPTION
CLEAR	Initialize the subscriber records before they are first entered. Do this only the first time that any records are entered
LI I*	List unit default record
EDIT I*;FLW=N,PVC=N	Disable private call and fleet-wide calls in the default record
LI T*	List talk group default record
SET	Move the default record into all subscriber records
LIST I700800-I700809	List units I700800 through I700809
EDIT I700123-I700140 ;ENA=N	Disable units I700123 through I700140
EDIT I700800;ENA=N	Disable unit I700800
EDIT I700809;ENA=N	Disable unit I700809
LIST I700800-I700809	List units I700800 through I700809
LI I*	List unit default record
STAT	All through activating and editing units. Turn the subscriber function on

3.9 SERV COMMAND - INTERCONNECT SHARED SERVICE ALGORITHM

The interconnect shared service command family provides the system manager with those commands necessary to query and/or modify parameters that affect operation of the shared service algorithm. The interconnect parameter limits can be adjusted to meet the demands of traffic based upon time of day as well as the system owner's preference for grade of service of dispatch versus interconnect call traffic. The parameters are as follows:

- Target Average Dispatch Busy Delay
- Target Average Interconnect Busy Delay
- Repeaters Reserved For Dispatch Calls (yes/no)
- Minimum Numbers of Repeaters Usable for Interconnect
- Maximum Interconnect Time-out
- Minimum Interconnect Time-out

A basic understanding of the operation of the shared service algorithm is helpful in selecting parameter values from a preset factory programmed table (see Table 4).

3.9.1 Update Interval

Every 15 minutes the shared service algorithm updates the interconnect call time-out length and the maximum number of simultaneous interconnect calls allowed. The parameter update is based upon the average access delay for dispatch and interconnect calls and the erlang load of dispatch traffic.

3.9.2 Adjustment of Simultaneous Interconnect Calls

The number of simultaneous interconnect calls allowed is adjusted in two stages.

First Stage - A calculation of the dispatch erlangs used during the previous 15 minute interval reserves a specific number of repeaters for dispatch only use for the next interval. No repeaters are reserved, however, if the shared service parameter table indicates "0" in the Repeater Reserved for Dispatch entry.

Second Stage - Comparison of the actual average dispatch access delay measured on the system during the last 15 minute interval to the target value determines whether the number of simultaneous interconnect calls allowed is increased, decreased or left unchanged.

Shared service algorithm increases the number of interconnect calls allowed if: the average dispatch access delay is less than its target value.

The number of simultaneous interconnect calls allowed is not increased to a value greater than that consistent with the number of repeaters for dispatch, as determined in the first stage. If the algorithm attempts to do this, the value is set consistent with the reserved number.

Shared service algorithm decreases the number of interconnect calls allowed if: the average dispatch access delay is greater than its target.

The number of simultaneous interconnect calls allowed is not decreased to a value less than that consistent with the minimum number of repeaters usable for interconnect. If the algorithm attempts to do this, the value is not changed, but the interconnect call time-out is decreased by 30 seconds (subject to the minimum interconnect time-out) to service more interconnect calls per unit time.

NOTE

The second stage of adjustment is not performed if the algorithm is disabled (see DISABLE command paragraph 3.9.4.4).

3.9.3 Interconnect Time-Out Adjustment

In addition to the adjustments mentioned above, the Interconnect Call Time-Out is modified as follows:

Shared service algorithm increases the interconnect time-out by 30 seconds if the interconnect delay is below its target values.

Shared service algorithm decreases the interconnect time-out by 30 seconds if the interconnect delay exceeds its target value.

(The interconnect time-out is subject to maximum and minimum set values, as specified in Table 4. Shared Service Parameters.)

3.9.4 SERV Commands

The shared service commands are as follows:

Command	Section	Description
Disable	3.9.4.4	Disable algorithm from adjusting parameters from set limits
Enable	3.9.4.3	Enable algorithm to adjust parameters within set limits
List	3.9.4.1	List shared service parameters
Quit	3.9.4.7	Exit to GUARDIAN prompt GRD>
SET	3.9.4.2	Edit shared service parameters
SETD	3.9.4.6	Edit dispatch timeout parameters
STats	3.9.4.5	List system call processing statistics

Table 4. Shared Service Parameters

TABLE ENTRY NUMBER	0	1	2	3	4	5	6	7
TARGET AVERAGE DISPATCH DELAY (SEC)	5	5	2	2	5	5	2	5
TARGET AVERAGE INTERCONNECT DELAY (SEC)	30	30	12	30	30	30	30	30
REPEATERS RESERVED FOR DISPATCH	Y	N	Y	Y	Y	Y	N	Y
MIN. # OF INTERCONNECT REPEATERS	1	1	1	1	1	1	3	0
MAX. INTERCONNECT TIME-OUT (MIN)	8	15	10	4	5	3	25	8
MIN. INTERCONNECT TIME-OUT (MIN)	2	4	3	2	1	.5	3	3

NOTE

Table entry number 0 is the default number programmed into the system for weekdays 6AM-6PM. Table entry 1 is the default number programmed into the system for the weekends (all times) and weekdays 6PM -6AM. Entry 2 contains values for a lightly loaded system. Entries 3, 4 and 5 favor dispatch entry. Entry 6 favors interconnect. Entry 7 allows the system to shut out interconnect calls during peak dispatch periods.

The shared service command family is accessed through the SERV command. The function of these commands is shown in the following examples.

3.9.4.1 LIST COMMAND

The LIST command allows the system manager to display the shared service parameter table and dispatch timeout table entries that are assigned for each 2 hour period of a day be it a weekday or a weekend (see Table 4. Shared Service Parameters for additional details). The first parameter table number on the left of each table assigns a set of parameters to the service algorithm for a 2 hour time period from 12 midnight to 1:59AM. The last entry on the right is for the time period of 10PM to 11:59PM.

```
GRD> SERV(cr)
SERV> LIST(cr)
SHARED SERVICE TABLES

WEEKDAY:  1 1 1 0 0 0 0 0 0 1 1 1
WEEKEND:  1 1 1 1 1 1 1 1 1 1 1 1

DISPATCH TIMEOUTS

WEEKDAY:  1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
WEEKEND:  1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
SERV> Q(cr)
GRD>
```

If the dispatch timeout table is disabled in the code plug, only the shared service parameter table is shown.

3.9.4.2 SET COMMAND

The SET command allows the system manager to edit the parameter table entry number assigned to a 2 hour period of a day. The command format is SET WEEKDAY HH N or SET WEEKEND HH N. HH is the hour of the day and N is a parameter table entry number from 0-7. A space is required between each field.

```

GRD> SERV(cr)
SERV> SET WEEKDAY 02 4(cr)
SERV> SET WEEKEND 23 3(cr)
SERV> LIST(cr)
SHARED SERVICE TABLES

WEEKDAY:  1  4  1  0  0  0  0  0  0  1  1  1
WEEKEND:  1  1  1  1  1  1  1  1  1  1  1  3

DISPATCH TIMEOUTS

WEEKDAY:  1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
WEEKEND:  1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
SERV> Q(cr)
GRD>

```

3.9.4.3 ENABLE COMMAND

The ENABLE command allows the shared service algorithm to adjust the number of simultaneous interconnect calls and the maximum interconnect call length to values within the parameter set limits depending on dispatch and interconnect access delays. The system default is enabled.

```

GRD> SERV(cr)
SERV> ENABLE(cr)
SERV> Q(cr)
GRD>

```

3.9.4.4 DISABLE COMMAND

The DISABLE command prohibits the shared service algorithm from adjusting any set parameters based on access delays. The maximum number of simultaneous interconnect calls for the disabled mode is equal to the total number of active repeaters minus the number of repeaters reserved for dispatch. The number of repeaters reserved for dispatch is determined by the dispatch erlang load (see Adjustment of Simultaneous Interconnect Calls, paragraph 3.9.2). The maximum interconnect call length is set to the value of the minimum interconnect time-out.

```

GRD> SERV(cr)
SERV> DISABLE(cr)
SERV> Q(cr)
GRD>

```

3.9.4.5 STATS COMMAND

The Stats command allows the system manager to obtain an output listing of system statistics pertaining to dispatch and interconnect call processing. The output is selectable for the following time periods: Instantaneous (current 15 minute parameter update period), Yesterday (each 15 minute period of yesterday) and Today (each 15 minute period of the current day). Example 11 shows how to use the STATS command.

Example 11.

GRD> SERV(gr)											
SERV> STATS INST(gr)											
DATE	AVG	AVG	#SIMU	INTR	# OF	# OF	# OF	AVG	AVG	# OF	# OF
5/25/87	DISP	INTR	INTR	TIME	ACTIVE	DISP	INTR	DISP	INTR	DISP	INTR
TIME	DELAY	DELAY	CALLS	OUT	RPTRS	CALLS	CALLS	LNTH	LNTH	BUSY	BUSY
12:15:00	1.5	15.4	3	300.0	15	300	80	16.3	127.1	5	11
SERV> STATS TODAY(gr)											
DATE	AVG	AVG	#SIMU	INTR	# OF	# OF	# OF	AVG	AVG	# OF	# OF
5/25/87	DISP	INTR	INTR	TIME	ACTIVE	DISP	INTR	DISP	INTR	DISP	INTR
TIME	DELAY	DELAY	CALLS	OUT	RPTRS	CALLS	CALLS	LNTH	LNTH	BUSY	BUSY
00:00:00	0.0	0.0	10	480.0	15	25	10	10.2	355.4	0	2
00:15:00	0.0	0.0	10	480.0	15	15	12	17.4	150.2	0	6
....											
....											
....											
12:15:00	1.5	15.4	3	300.0	15	300	80	16.3	127.1	5	11
SERV> STATS YES(gr)											
DATE	AVG	AVG	#SIMU	INTR	# OF	# OF	# OF	AVG	AVG	# OF	# OF
5/25/87	DISP	INTR	INTR	TIME	ACTIVE	DISP	INTR	DISP	INTR	DISP	INTR
TIME	DELAY	DELAY	CALLS	OUT	RPTRS	CALLS	CALLS	LNTH	LNTH	BUSY	BUSY
00:00:00	0.0	0.0	11	480.0	15	13	5	13.7	90.6	0	0
00:15:00	0.0	0.0	11	480.0	15	22	12	17.1	140.8	0	0
....											
....											
....											
23:30:00	0.0	0.0	9	600.0	15	7	3	18.1	130.4	0	0
23:45:00	0.0	0.0	9	600.0	15	19	2	9.7	110.6	0	0

Detailed column headings for STATS listings are shown below:

Field Heading	Example	Description
DATE 5/25/88 TIME	5/25/88	Date of Day being Reported
	12:15:30	Time of Day being Reported
AVG DISP DELAY	1.5	Average Dispatch Delay in Seconds
AVG INTR DELAY	15.4	Average Interconnect Delay in Seconds
#SIMU INTR CALLS	3	Number of Simultaneous Interconnect Calls (Maximum Possible)
INTR TIME OUT	300.0	Interconnect Call Time-Out in Seconds
# OF ACTIVE RPTRS	15	Number of Active Repeaters
# OF DISP CALLS	300	Number of Dispatch Calls
# OF INTR CALLS	80	Number of Interconnect Calls
AVG DISP LNTH	16.3	Average Dispatch Call Length in Seconds
AVG INTR LNTH	127.1	Average Interconnect Call Length in Seconds
# OF DISP BUSY	5	Number of Dispatch Busies
# OF INTR BUSY	11	Number of Interconnect Busies

3.9.4.6 SETD COMMAND

The SETD command allows the operator to edit the dispatch timeout assigned to a 2 hour period of a day. The command format is SETD WEEKDAY HH N.N or SETD WEEKEND HH N.N. HH is the hour of the day and N.N is a number of minutes from 0.5 to 3.0. A space is required between SETD, WEEKDAY or WEEKEND, HH, and N.N. The SETD command rounds the number of minutes entered to the nearest half-minute (.5 or .0). This command is only available if the dispatch timeout table is enabled in the code plug.


```

GRD> SERV
SERV> SETD WEEKDAY 02 0.5
SERV> SETD WEEKEND 23 2.0

SERV> LIST
SHARED SERVICE TABLES

WEEKDAY:  1 4 1 0 0 0 0 0 1 1 1
WEEKEND:  1 1 1 1 1 1 1 1 1 1 3

DISPATCH TIMEOUTS

WEEKDAY:  1.0 0.5 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
WEEKEND:  1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 2.0

SERV> Q
GRD>

```

3.9.4.7 QUIT COMMAND

The QUIT command exits from SERV. Control is returned to the GRD> prompt.

3.10 STAT COMMAND

The STAT command allows the system manager to query the status of the system. It displays central controller, SAC, shared service, diagnostic and interconnect settings.

Example 12 shows how to use the STAT command.

Example 12.

```

GRD> STAT(gr)

STATUS OF SYSTEM 0023 AT  9:58:35  FRIDAY  7/29/88

CENTRAL CONTROLLER      ACTIVE MAIN
SUBSCRIBER ACCESS CONTROL INACTIVE
SHARED SERVICE          ACTIVE
DIAGNOSTICS             AUTOMATIC
AUTHORIZATION LIST      INACTIVE          (D401 or D163 only)
BILLING CALCULATIONS    DISABLED          (D401 or D163 only)
LOGGING                 TOLL CALLS ONLY (D401 or D163 only)
PBX PROCESSING          INACTIVE          (D401 or D163 only)

GRD>

```

3.11 TEST COMMAND

The TEST command activates the software Diagnostic System Test. It is identical to the manual test performed when activated by the front panel TEST pushbutton (see Figures 4 and 5) on the Central Site Controller module. The software Diagnostic System Test includes tests on all three site controller board modules, the CSC, RSC and TSC.

The tests on the CSC are:

- A test of each RAM integrated circuit.
- A test of each EPROM integrated circuit, through a checksum process (sum of bytes in each EPROM should equal a specified number).
- A test on battery backed memory.

The tests on the RSC are:

- A test of each RAM integrated circuit.

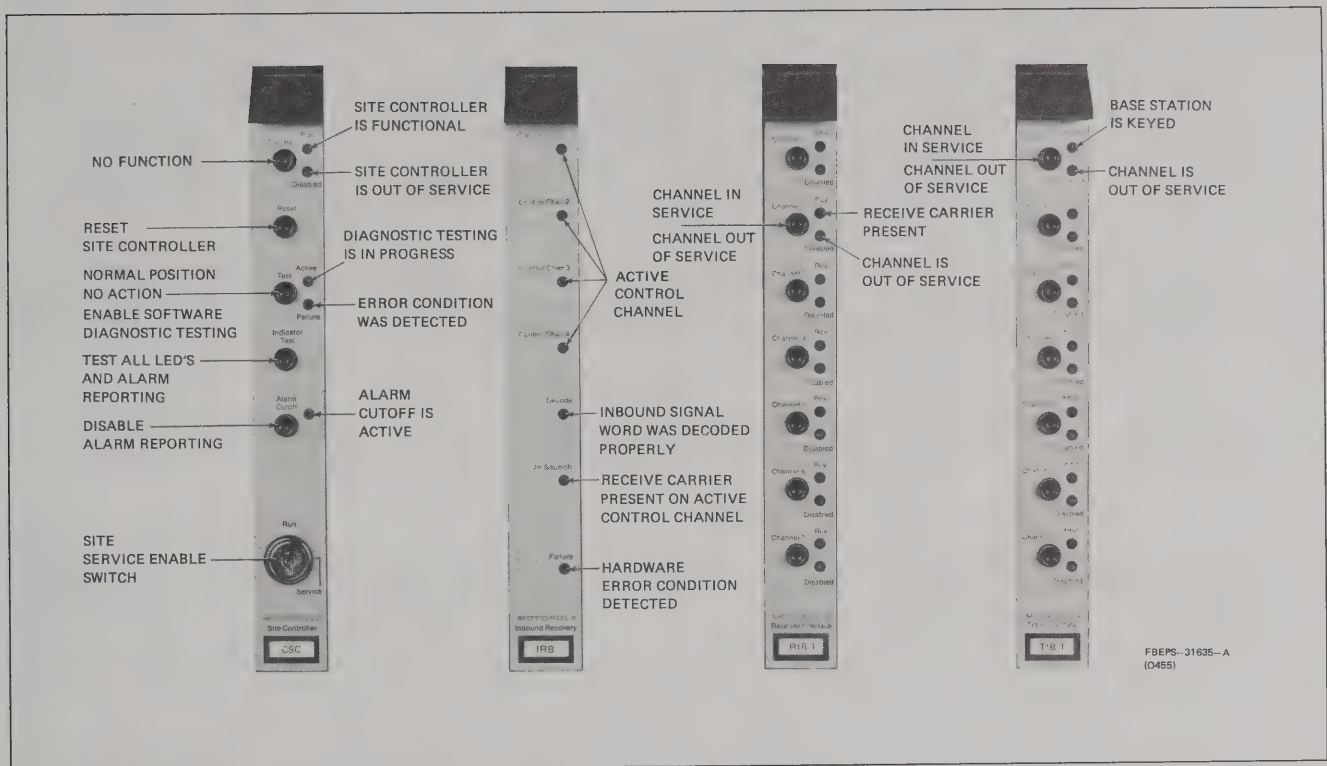


Figure 4. Module Controls and Indicators (All Models)

- A test of each EPROM integrated circuit, through a checksum process.
- An IRB check.
- A RIB check - tone detectors.

The tests on the TSC are:

- A test of each RAM integrated circuit.
- A test of each EPROM integrated circuit, through a checksum process.
- A TIB check - keys channels and checks transmitter status.

The tests on the MCB (With Options D163 or D401) are:

- A test of each RAM integrated circuit.
- A test of each EPROM integrated circuit, through a checksum process.

The tests on the PLIB are:

- A test of each RAM integrated circuit.
- A test of each EPROM integrated circuit, through a checksum process.
- A DTMF loopback test.
- A dial tone detect test.
- A TELCO line test.
- A matrix vertical test (part of matrix board).

NOTE

At the 2400 hour (12:00 Midnight) rollover time, as determined by the system realtime clock, the Diagnostic System Test is automatically activated, but only if enabled in the code plug. The actual start of the test is deferred until there is no current active voice channel communications. When all voice channels are unused, the test begins. The control channel is designated, and a complete software Diagnostic System Test is performed. The outcome of the test is the same as if initiated via the front panel TEST pushbutton on the CSC module.

Examples of TEST command usages follows:

```
GRD> TEST(CP)
```

NOTE

A simple procedure to find the cause of failure is, with alarms enabled, to either perform a manual system reset (via the CSC RESET pushbutton) or perform a system reset (via the system manager's terminal). To cause a system reset from the terminal, the system manager enters ESC *. The TEST command, unlike a CSC RESET, will wait for all calls to end before performing a test.

The following paragraph describes the trunked radio system central controller RAM and EPROM test failure indications which occur when either the CSC, RSC or TSC module produce a test error. These indications include LED displays, printed error messages and system reversion to FAILSOFT operation.

NOTE

The central controller modules test the RAM integrated circuits first and the EPROM integrated circuits second. If an error condition is detected during the RAM test, the EPROM test is not performed.

CSC, RSC or TSC Module Fails RAM or EPROM Test

The system manager does not receive an indication that the RAM or EPROM test failed if the ALARM CUTOFF button on the respective module (RSC or TSC) front panel is depressed when the test is initiated. The error condition is disregarded and normal program execution is attempted. If the ALARM CUTOFF button is not depressed and a terminal is not connected to the respective module RS-232-C port, the FAILURE LED is on continuously, the ACTIVE LED flashes, and the system reverts to FAILSOFT operation. If the ALARM CUTOFF button is not depressed and a terminal is connected to the respective module RS-232-C port, the FAILURE LED is on continuously, the RAM or EPROM error condition is printed at the terminal, and the system reverts to FAILSOFT operation. After a test failure is indicated, the system manager may instruct the central controller to disregard the error condition by depressing the ALARM CUTOFF button. The central controller responds by printing ERROR ACKNOWLEDGED at the terminal, if it is connected, and attempts normal program execution.

Table 5 summarizes system operation during site controller module failure.

Table 5. Failed Site Controller Module Summary

Description	Printed Message				
CSC Module in Failed Mode: • System Révert to FAILSOFT Operation	NONE				
RSC Module in Failed Mode: • CSC Works Normally • System Revert to FAILSOFT Operation	*DIAG* HH:MM:SS	MM/DD/YY	MA OO CSC	E0 0F 00 01	
	DIAG HH:MM:SS	MM/DD/YY	MA OO CSC	E0 0F 08 21	
TSC Module in Failed Mode: • CSC Works Normally • RSC Works Normally • System Revert to FAILSOFT Operation	*DIAG* HH:MM:SS	MM/DD/YY	MA OO CSC	E0 0F 00 01	
	DIAG HH:MM:SS	MM/DD/YY	MA OO RSC	55 0F 00 01	
	DIAG HH:MM:SS	MM/DD/YY	MA OO CSC	E0 0F 08 24	

The RESTART function provides for a total reinitialization of the system. The program automatically restarts when it detects a:

- RAM failure on CSC module, or
- EPROM failure on CSC module, or
- Master RESET via module front panel or terminal, or
- Software detected error, or
- Power failure, or
- ESC * entered from the system manager's terminal.

Table 6 summarizes system operation during the RESTART function.

*Table 6.
RESTART Function System Operation Summary*

When the CSC Module Restarts: <ul style="list-style-type: none"> • RSC Module Resets • TSC Module Resets • All Variables are Re-initialized at CSC Module
When the RSC Module Restarts: <ul style="list-style-type: none"> • RSC Module Resets • Channel Status Updated at CSC Module • All Current Calls are Terminated • Reassign Control Channel
When the TSC Module Restarts: <ul style="list-style-type: none"> • TSC Module Resets • Channel Status Updated at CSC Module • All Current Calls are Terminated • Reassign Control Channel

3.12 TIME COMMAND

The TIME command allows the system manager to query and/or modify the time set on the system clock. The time is in 24-hour format, as shown below:

HH:MM:SS where HH = hour (00-23)
 MM = minutes (00-59)
 SS = seconds (00-59)

An example of how to use the TIME command follows:

```
GRD> TIME(cr)
CURRENT TIME (HH:MM:SS) IS: 9:39:14
CORRECT (Y/N)? N(cr)
CHANGE TIME (HH:MM:SS) TO: 9:34:15(cr)
CURRENT TIME (HH:MM:SS) IS: 9:34:15
CORRECT (Y/N)? Y(cr)

GRD>
```

3.13 VER COMMAND

The VER command displays current version numbers of various system attributes, including the code plug, CSC, and MCB.

An example of how to use the VER command follows:

```
GRD> VER(cr)
CP VERSION 04
CSC VERSION V31.1
MCB VERSION 0382

GRD>
```

3.14 EMRG COMMAND

The EMRG command permits the system manager to examine and modify parameters associated with emergency call handling.

3.14.1 TOP Command

Top of queue method for channel assignment when no channel is available. Emergency call requests are put on the emergency queue and are processed as soon as a channel becomes available. Also, to free up a channel quicker, all calls (except phone calls and emergency calls) become transmission trunked (no repeater hang time).

3.14.2 PREEMPT Command

Preemptive method for channel assignment when no channel is available. The lowest priority call is terminated (phone calls and emergency calls are not preempted). The channel assigned for the terminated call is re-assigned for an emergency call. If no call can be terminated, the aforementioned top of queue method is used. It should be noted that the emergency call is assigned to the same channel as an active call, and, that voice contention may occur.

3.14.3 RESERVE NN Command

Reserves NN channels for emergency ONLY traffic. The valid range for NN is 0 to 18, independent of the number of channels in the system. However, the maximum number of channels reserved at any time equals the number of useable channels minus 2.

e.g.: For a 10-channel system, the maximum number of reserved channels is 8 (if all channels are useable) even though NN may be any value up to and including 18.

3.14.4 HOLD MM:SS Command

Changes the extended repeater hold time to the value entered (where MM = minutes and SS = seconds). The range for this value is 00:00 to 26:59. The hold time is added to the message trunked time-out (see PARM command) for emergency calls,

3.14.5 LIST Command

This command lists the emergency call parameters.

3.14.6 QUIT Command

This command exits the user to the GRD prompt.

The following is an example of the EMRG feature:

```

GRD> EMRG
EMRG> HELP
AVAILABLE COMMANDS FOR YOUR LOGON ID ARE:
  QUIT
  HOLD
  RESERVE
  LIST
  TOP
  PREEMPT
EMRG> LIST
HOLD T.O. = 0:32
NUMBER OF RESERVED REPEATERS = 0
EMERGENCY CALL HANDLING = TOP OF QUEUE
EMRG> HOLD :45
EMRG> RESERVE 1
EMRG> PREEMPT
EMRG> LIST
HOLD T.O. = 0:45
NUMBER OF RESERVED REPEATERS = 1
EMERGENCY CALL HANDLING = RUTHLESS PRE-EMPTION
EMRG> QUIT
GRD>

```

3.15 MGC COMMAND

The MGC command permits the system manager to examine and modify parameters associated with multi-group calls.

3.15.1 INT Command

Interrupt method for handling an multi-group call channel assignment when talk group calls are active in the multi-group talk group's fleet. All active dispatch calls in the multi-group talk group's fleet will be terminated and the multi-group call will be started on the first available channel.

3.15.2 WAIT Command

Wait method for handling an multi-group call channel assignment when talk group calls are active in the multi-group talk group's fleet. All active dispatch calls in the multi-group talk group's fleet will be transmission trunked and the multi-group call will wait until all the dispatch calls have ended before it can be assigned.

3.15.3 STAT Command

This command lists the multi-group call processing status.

3.15.4 QUIT Command

This command exits the user to the GRD prompt.

The following is an example the MGC feature:


```

GRD> MGC
MGC> HELP
AVAILABLE COMMANDS FOR YOUR LOGON ID ARE:
  QUIT
  STAT
  INT
  WAIT
MGC> STAT
MULTI-GROUP MODE = WAIT
MGC> INT
MULTI-GROUP MODE = INTERRUPT
MGC> QUIT
GRD>

```

3.16 DVP COMMAND

The *DVP* command permits the system manager to examine and modify parameters associated with digital voice privacy, or, secure capable operations.

3.16.1 RESERVE NN Command

Reserves NN channels for secure ONLY traffic. The valid range for NN is 0 to 18, independent of the number of channels in the system. However, the maximum number of channels reserved at any time equals the number of useable channels minus 2.

e.g.; For a 10-channel system, the maximum number of reserved channels is 8 (if all channels are useable) even though NN may be any value up to and including 18.

3.16.2 INTERCONNECT Command

This command gives the user the ability to select steering of secure capable units always to secure repeaters for interconnect calls. This is possible only if there are secure repeaters available. The user is notified if the interconnect calls are being steered, and, then prompted to either remain steered, or, to change to steered. This depends upon the status given by the INTERCONNECT command.

3.16.3 UPGRADE Command

This command gives the user the ability to allow or disallow call upgrades (normal to secure), with the exception of emergency calls, while the call is in progress. The user is notified if call upgrades are permitted, and, prompted to either allow calls to remain upgradable, or, to change to upgradable. This depends upon the status given by the UPGRADE command.

3.16.4 LIST Command

This command lists the aforementioned *DVP* parameters.

3.16.5 QUIT Command

This command exits the user to the GRD prompt.

The following is an example of the *DVP* feature:

```
GRD> DVP
DVP> HELP
AVAILABLE COMMANDS FOR YOUR LOGON ID ARE:
  QUIT
  INTERCONNECT
  UPGRADE
  LIST

DVP> LIST
INTERCONNECT CALLS ALWAYS STEERED TO SECURE REPEATERS
CALL UPGRADES PERMITTED

DVP> INTERCONNECT
INTERCONNECT CALLS ALWAYS STEERED TO SECURE REPEATERS
REMAIN STEERED (Y/N)? N

DVP> UPGRADE
CALL UPGRADES PERMITTED
REMAIN UPGRADABLE (Y/N)? N

DVP> LIST
INTERCONNECT CALLS NOT STEERED TO SECURE REPEATERS
CALL UPGRADES NOT PERMITTED

DVP> QUIT
GRD>
```

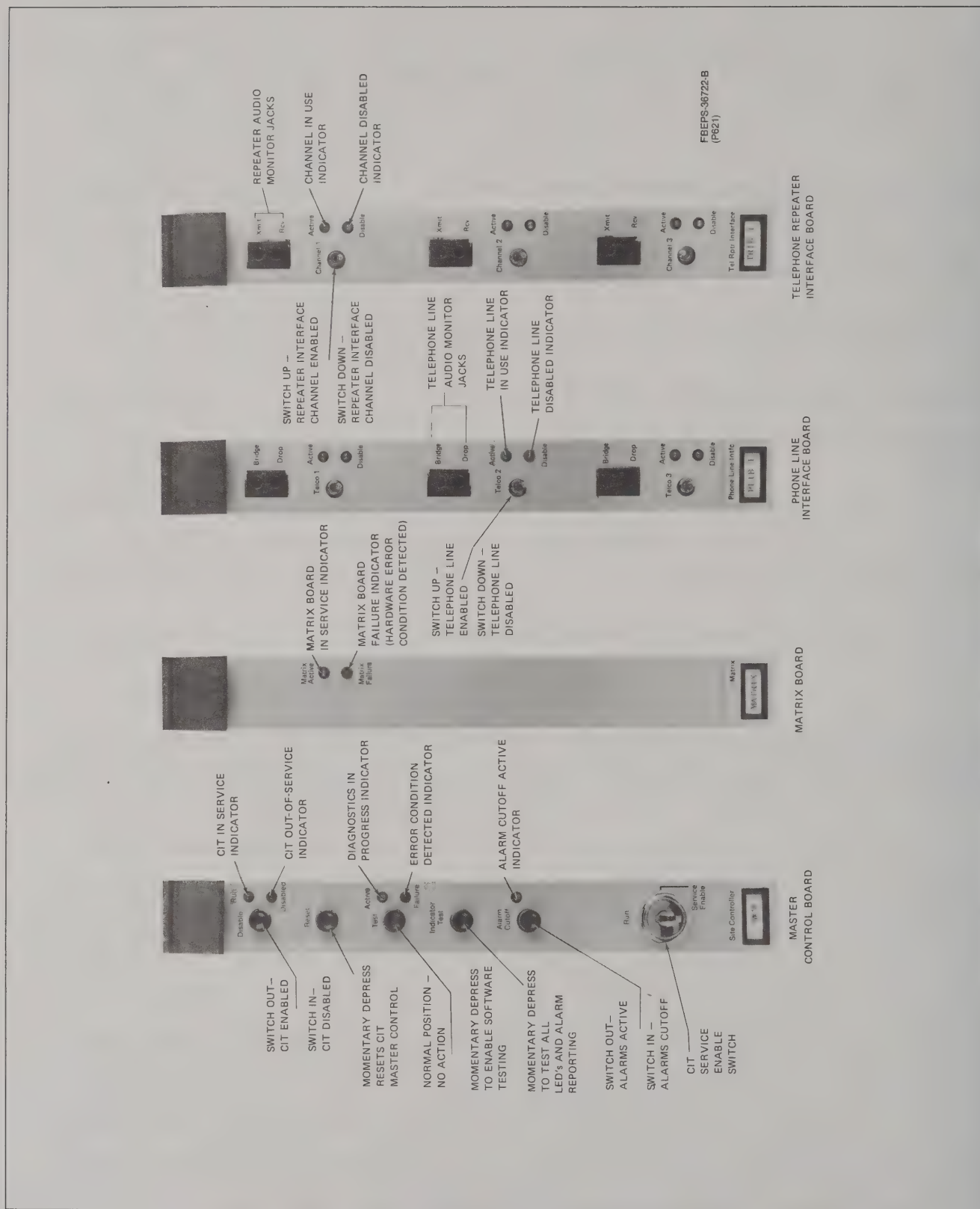


Figure 5. Module Controls and Indicators

4. COMMAND FUNCTIONS AND RESPONSES — TELEPHONE INTERCONNECT COMMANDS

The user data base consists mainly of two types of records, talk group and individual. Each record specifies attributes for an individual or talk group telling how a unit may use the system.

The ID scheme now consists of Type I and Type II IDs. Following is a description of the new ID structure for the *Smartnet II* protocol.

TYPE I IDs:

The ID scheme for Type I IDs in a *Smartnet II* system remains the same as Type I systems. That is, we continue to use the hexadecimal fleet-subfleet-individual convention. Individual IDs are referenced by a 3 digit hexadecimal fleet number, ranging from 000 to 77F, followed by a 3 digit hexadecimal individual number, ranging from 000 to FFE. Subfleets are also be referenced by the same fleet number followed by a 2 digit hexadecimal subfleet number, ranging from 00 to 0F. All the aforementioned ranges are dependent upon the size code.

When the subfleet ID is entered at the System Manager's Terminal, the subfleet portion must be preceded with an "S" to distinguish it from the individual ID.

Examples:

705	001	(fleet 705, individual 1)
10F	30F	(fleet 10F, individual 30F)

405	S01	(fleet 405, subfleet 1)
600	S0A	(fleet 600, subfleet A)

TYPE II IDs:

The Type II ID is referenced with a 6 digit decimal number. This number is the same as the Type II land-to-mobile interconnect and Private Call II IDs.

Individual IDs must begin with a "7" followed by 5 decimal digits ranging from 00001 to 65534. These 5 digits are a direct decimal conversion of the 4 digit hexadecimal ID. Talk group IDs must begin with an "8" followed by 5 decimal digits ranging from 00001 to 04094. Once again, these 5 digits are a direct decimal conversion of the 3 digit hexadecimal talk group ID.

When a Type II ID is entered at the System Manager Terminal, it must be preceded by an "I" or "T", for individual or talk group, respectively. This is to distinguish Type I and Type II IDs.

Examples:

I705001	(individual 5001)
I700235	(individual 235)

T800001	(talk group 1)
T800300	(talk group 300)

The following commands are available if the trunked system is equipped with interconnect. This means that the system was ordered with options D163 or D401 or the unit was upgraded in the field by adding Model T5188 or T5188 with D401 to the basic unit.

4.1 AUTH COMMAND

The authorization command family provides the system manager with those commands necessary to build and modify memory tables containing unit IDs and talk group IDs authorized for interconnect call service. The authorization command format is as follows:

Command	Section	Description
Add	4.1.1	Add unit or talk group to list
Delete	4.1.2	Delete unit or talk group from list
Edit	4.1.3	Edit unit or talk group record information
List	4.1.4	Provide current unit and talk group list
Pdigit	4.1.6	Predigit dialing sequence
Reset	4.1.7	Clear all user, talk group and billing information
Quit	4.1.9	Exit to GUARDIAN prompt GRD>
Status	4.1.5	Authorization list status
Update	4.1.8	Move changes into permanent memory

An example of the authorization command function follows:

```
GRD> AUTH(cr)
AUTH> QUIT(cr)
ACTIVE USER LIST
GRD>
```

The status of the authorization list is given to the system manager when leaving the authorization command family.

4.1.1 ADD Command

The ADD command enters a new unit ID or talk group ID for Type II systems, or, a new fleet/individual or fleet/subfleet for Type I systems, to the authorization table. An example of how to use the ADD command follows:

```
GRD> AUTH(cr)
AUTH> ADD 1757349(cr)
HALF DUPLEX (Y/N): Y(cr)
ENTER LOCAL LIMIT LEVEL (1-4): 1(cr)
ENTER AUTHORIZATION STATUS LEVEL (1-5): 2(cr)
ENABLE O+ DIALING (Y/N)? Y(cr)
ENABLE 1+ DIALING (Y/N)? Y(cr)
ENTER CUSTOMER GROUP: 103(cr)
L-M ACCESS NUMBER IS 757349

AUTH> ADD 800 100
HALF DUPLEX (Y/N)? N
ENTER LOCAL LIMIT LEVEL (1-4): 2
ENTER AUTHORIZATION STATUS LEVEL (1-5): 2
ENABLE O+ DIALING (Y/N)? Y
ENABLE 1+ DIALING (Y/N)? N
L-M ACCESS NUMBER IS 052480

AUTH> ADD 1757360*(cr)
ENTER CUSTOMER GROUP: 104(cr)
L-M ACCESS NUMBER IS 757360

AUTH> ADD T803587(cr)
ENTER LOCAL LIMIT LEVEL (1-4): 1(cr)
ENTER AUTHORIZATION STATUS LEVEL (1-5): 2(cr)
ENABLE O+ DIALING (Y/N)? Y(cr)
ENABLE 1+ DIALING (Y/N)? Y(cr)
ENTER CUSTOMER GROUP: 103(cr)
L-M ACCESS NUMBER IS 803587

AUTH> ADD 800 S01(cr)
ENTER LOCAL LIMIT LEVEL (1-4): 2(cr)
ENTER AUTHORIZATION STATUS LEVEL (1-5): 3(cr)
ENABLE O+ DIALING (Y/N)? Y(cr)
ENABLE 1+ DIALING (Y/N)? N(cr)
L-M ACCESS NUMBER IS 949664

AUTH> Q(cr)
ACTIVE USER LIST
GRD>
```

An explanation of the listing follows:

- ADD I757349 (Type II), 600 100 (Type I) - The unit ID is specified for Type II, with a space required between the ADD and the unit ID. The fleet/individual is specified for Type I. A space is required between the ADD and the fleet, and, between the fleet and the individual. The unit ID should appear on a label that is attached to the unit.
- Half duplex - This feature applies to the individual user's radio. A typical dispatch radio is half duplex compatible.
- Local limit level - The local call limit level specifies the maximum TELCO charge credit for a unit during a billing period. A user who exceeds the assigned call limit level is not allowed to make further calls until the call limit level is increased. The actual dollar amount (0-\$999.99) assigned to the four possible levels can be listed with the LTEL command. The dollar amounts were originally entered with the INIT command. The LTEL and INIT commands are part of the BILL command family.
- Authorization status level - This parameter specifies the authorized TELCO exchange coverage area for that unit. The five possible levels are defined as follows:
 1. No calls are allowed (monthly fixed AIRTIME charges are assigned).
 2. Calls that are free in the local area code as well as calls to nearby area code(s) that are free.
 - 1+ dialing may need to be enabled if a 1 is required preceding the call.
 - Any type of 0+ calling is allowed if enabled.
 - 411, 911 and 800 calls are allowed.
 3. Free and "unit calls" to exchanges in the local area code or nearby area code(s) that have had exchange rate information entered into the system memory.
 - 1+ dialing may need to be enabled if a 1 is required preceding the call.
 - Any type of 0+ calling is allowed if enabled.
 - 411, 911 and 800 calls are allowed.
 4. All exchanges in the local area code as well as all exchanges in any area code(s) specified nearby.
 - 1+ dialing may need to be enabled if a 1 is required preceding the call.
 - Any type of 0+ calling is allowed if enabled.
 - 411, 911 and 800 calls are allowed.
 5. All exchanges in all area codes.
 - 1+ dialing may need to be enabled if a 1 is required preceding the call.
 - Any type of 0+ calling is allowed if enabled.
 - 411, 911 and 800 calls are allowed.

0+ refers to the TELCO credit card calls, i.e., 0-312-976-1212. The LEXC command can be used to list out the TELCO exchange rates for the system area code plus those that are in nearby codes. The exchange rates were originally entered with the INIT command. The LEXC and INIT commands are part of the BILL command family.

- Customer Group - The customer group will be used to summarize call information for individual units and talk groups into customer groups. The customer number may be any value between 1 and FFE. It may be a fleet number if that is convenient, or other numbers can be used to create super groups or sub groups as required by the system manager. This number need not be added for Type I talk groups, since the customer group is automatically set to the fleet entered.
- L-M Access Number - The L-M access number for Type II units is the 6 digit extension that is dialed by the land party when calling that party's radio. The access number is constant for each unit and may be calculated by taking the number 7 and appending the unit hex ID number converted to a 5 position decimal (leading zeros are significant). Type I systems use the 6 digit ID determined by the sizecode prefix, fleet, subfleet, and individual IDs.
- ADD I757360* - Entering the * character after the unit ID results in a set of default parameters being assigned to the unit. The default parameters do not include the unit's customer group. The default parameters can be displayed with the LIST command or changed with the EDIT command.
- ADD T803587 (Type II), 600 S01 (Type I) - The talk group ID is specified for Type II, with a space required between the ADD and the talk group ID.

- Local limit level, authorization status level, 0+ and 1+ - these parameters are the same as described in the individual unit records.
- L-M Access Number - The L-M access number for Type II talk groups is the 6 digit extension that is dialed by the land party when calling the talk group. The access number may be calculated by taking the digit 8 and appending the talk group ID number converted to a 5 position decimal number (leading zeros are significant). Type I systems use the 6 digit ID determined by the sizecode prefix, fleet, subfleet, and individual IDs.

When the system is first installed, the authorization tables are blank. The default condition for such a system is that all mobile to land interconnect calls are authorized for 7 digit calling only. Land to mobile calls are authorized. The system limits interconnect authorization to those units that reside on the authorization table after the authorization list has been activated through the Status command, which have the correct level of authorization.

The CIT (Central Interconnect Terminal) calculates land to mobile IDs based upon the unit ID or talk group ID for Type II, and, the prefix, fleet, subfleet, and individual for Type I. If the authorization table has to be reconstructed, the units may be entered in any order, as the order has nothing to do with the access number created.

4.1.2 DELETE Command

The DELETE command removes an existing unit ID or talk group ID from the authorization table. An example of how to use the DELETE command follows:

```
GRD> AUTH(cr)
AUTH> DEL I757349(cr)
DELETE UNIT # 757349 (Y/N)? N(cr)
AUTH> DEL I757349(cr)
DELETE UNIT # 757349 (Y/N)? Y(cr)
UNIT DELETED
AUTH> DEL I757349(cr)
NOT ON USER LIST
AUTH> DEL 600 100(cr)
L-M ACCESS NUMBER IS 052480
DELETE FLEET # 600 UNIT # 100 (Y/N)? Y(cr)
UNIT DELETED
AUTH> DEL T803587(cr)
DELETE TALK GROUP # T803587 (Y/N)? Y(cr)
TALK GROUP DELETED
AUTH> DEL 600 S01
DELETE FLEET # 600 SUBFLEET # 001 (Y/N)? Y(cr)
TALK GROUP DELETED
AUTH> QUIT(cr)
ACTIVE USER LIST
GRD>
```

An explanation of the listing follows:

- DEL I757349 (Type II), 600 100 (Type I) - The unit ID for Type I, or, the fleet/individual ID for Type I, is entered following a mandatory space. The ID assigned to a radio should be printed on a label that is attached to the radio.

4.1.3 EDIT Command

The EDIT command changes authorization parameters that are assigned to a particular unit or talk group for Type II, or, a fleet/individual or fleet/subfleet for Type I. An example of how to use the EDIT command follows:

```

GRD> AUTH(cr)
AUTH> EDIT I757349(cr)
      L-M ACCESS NUMBER IS 757349
      1. HALF DUPLEX
      2. LOCAL CALL LIMIT LEVEL 4
      3. AUTHORIZATION LEVEL 4
      4. 0+ DIALING ENABLED
      5. 1+ DIALING ENABLED
      6. CUSTOMER GROUP NUMBER 017
      ENTER # OF PARAMETER TO CHANGE OR Q TO QUIT: 2(cr)
      ENTER LOCAL LIMIT LEVEL (1-4): 2(cr)
      ENTER # OF PARAMETER TO CHANGE OR Q TO QUIT: Q(cr)

AUTH> EDIT 600 100(cr)
      L-M ACCESS NUMBER IS 052480
      1. HALF DUPLEX
      2. LOCAL CALL LIMIT LEVEL 3
      3. AUTHORIZATION LEVEL 3
      4. 0+ DIALING ENABLED
      5. 1+ DIALING ENABLED
      ENTER # OF PARAMETER TO CHANGE OR Q TO QUIT: 2(cr)
      ENTER LOCAL LIMIT LEVEL (1-4): 2(cr)
      ENTER # OF PARAMETER TO CHANGE OR Q TO QUIT: Q(cr)

AUTH> EDIT *(cr)
      1. HALF DUPLEX
      2. LOCAL CALL LIMIT LEVEL 2
      3. AUTHORIZATION LEVEL 4
      4. 0+ DIALING DISABLED
      5. 1+ DIALING DISABLED
      ENTER # OF PARAMETER TO CHANGE OR Q TO QUIT: 2(cr)
      ENTER LOCAL LIMIT LEVEL (1-4): 2(cr)
      ENTER # OF PARAMETER TO CHANGE OR Q TO QUIT: Q(cr)

AUTH> EDIT T803587(cr)
      L-M ACCESS NUMBER IS 803587
      2. LOCAL CALL LIMIT LEVEL 3
      3. AUTHORIZATION LEVEL 3
      4. 0+ DIALING ENABLED
      5. 1+ DIALING ENABLED
      6. CUSTOMER GROUP NUMBER 017
      ENTER # OF PARAMETER TO CHANGE OR Q TO QUIT: 3(cr)
      ENTER CUSTOMER GROUP: 018(cr)
      ENTER # OF PARAMETER TO CHANGE OR Q TO QUIT: Q(cr)

AUTH> EDIT 600 S01(cr)
      L-M ACCESS NUMBER IS 949664
      2. LOCAL CALL LIMIT LEVEL 2
      3. AUTHORIZATION LEVEL 2
      4. 0+ DIALING ENABLED
      5. 1+ DIALING ENABLED
      ENTER # OF PARAMETER TO CHANGE OR Q TO QUIT: 5
      ENABLE 1+ DIALING (Y/N)? Y(cr)
      ENTER # OF PARAMETER TO CHANGE OR Q TO QUIT: Q(cr)

AUTH> Q(cr)
ACTIVE USER LIST

GRD>

```

An explanation of the listing follows:

- EDIT I757349 (Type II), 600 100 (Type I) - The unit ID for Type II, or, the fleet/individual for Type I, is entered following a mandatory space. The ID assigned to the unit should be printed on a label attached to the radio.
- EDIT * - The * character specifies the default authorization parameter block. The default parameter block can be used to simplify the process of adding new users to the authorization table.
- EDIT T803587 (Type II), 600 S01 (Type I) - The talk group ID for Type II, or, the fleet/subfleet for Type I, is entered following a mandatory space.

4.1.4 LIST Command

The LIST command displays the IDs of users and talk group IDs that reside on the authorization table with current settings for each ID.

The LIST command may be used in one of four different manners:

- If the LIST command is issued with no arguments, all of the unit and talk group IDs are shown. In other words, the entire authorization table is shown.
- If the LIST command is followed by a single unit ID or a talk group ID, the data for that single item is displayed.

GRD> AUTH(cr)							
AUTH> LIST(cr)							
CUSTOMER GROUP	UNIT ID	DUPLEX TYPE	LOCAL LEVEL	AUTH. LEVEL	ENABLED		LAND ACCESS
					O+	1+	
000	001	HALF	4	4	YES	YES	229377
000	015	HALF	2	4	NO	NO	229397
000	068	HALF	2	4	NO	NO	229480
000	S01	HALF	2	4	NO	NO	902048
100	001	HALF	2	4	NO	NO	229377
600	011	HALF	2	4	NO	NO	052241
600	S01	HALF	2	4	NO	NO	949664
700	I757344	HALF	3	4	YES	YES	757344
700	I757345	HALF	2	4	NO	NO	757345
700	T803585	HALF	2	4	NO	NO	803585
AUTH> LIST 600 011(cr)							
CUSTOMER GROUP	UNIT ID	DUPLEX TYPE	LOCAL LEVEL	AUTH. LEVEL	ENABLED		LAND ACCESS
					O+	1+	
600	011	HALF	2	4	NO	NO	052241
AUTH> LIST I757348-I757350(cr)							
CUSTOMER GROUP	UNIT ID	DUPLEX TYPE	LOCAL LEVEL	AUTH. LEVEL	ENABLED		LAND ACCESS
					O+	1+	
200	I757346	HALF	3	4	YES	YES	757346
200	I757347	HALF	3	4	YES	NO	757347
500	I757348	HALF	2	3	NO	NO	757348
500	I757349	HALF	3	4	YES	YES	757349
500	I757350	FULL	3	4	YES	YES	757350
AUTH> LIST 600 S01(cr)							
CUSTOMER GROUP	UNIT ID	DUPLEX TYPE	LOCAL LEVEL	AUTH. LEVEL	ENABLED		LAND ACCESS
					O+	1+	
600	S01	HALF	1	2	YES	YES	949664
AUTH> LIST T803587(cr)							
CUSTOMER GROUP	UNIT ID	DUPLEX TYPE	LOCAL LEVEL	AUTH. LEVEL	ENABLED		LAND ACCESS
					O+	1+	
600	T803587	HALF	1	2	YES	YES	803587


```

AUTH> LIST *(cr)
-----
CUSTOMER UNIT    DUPLEX    LOCAL    AUTH.    ENABLED    LAND
GROUP   ID      TYPE      LEVEL    LEVEL      O+      1+      ACCESS
-----
   ---    *      HALF        2        4        NO        NO      -----

AUTH> LIST G000(cr)
-----
CUSTOMER UNIT    DUPLEX    LOCAL    AUTH.    ENABLED    LAND
GROUP   ID      TYPE      LEVEL    LEVEL      O+      1+      ACCESS
-----
   000    001    HALF        4        4        YES       YES    229377
   000    015    HALF        2        4        NO        NO     229397
   000   T800001  FULL        2        3        YES       NO     800001
   000   T800002  HALF        2        3        YES       YES    800002

AUTH> QUIT(cr)
ACTIVE USER LIST

GRD>

```

- If the LIST command is followed by an asterisk, the data for the default record is displayed.
- If the LIST command is followed by a range of IDs, the unit and talk group IDs that fall into the range listed. If the LIST command is followed by a customer group numbers, all unit and talk group IDs which are in that customer group are listed. Examples of how to use the LIST command follows:

The LIST command displays the authorization table for the entire system.

The LIST T command displays the authorization table for talk groups on the system.

The LIST G command displays the authorization table for units and talk groups within a customer group in the system.

4.1.5 STATUS Command

The STATUS command enables or disables the authorization process. After the system is first turned on or after a loss of memory, the authorization status defaults to an inactive state which limits the calling capability of mobile to land calls to 7-digit phone numbers. The status should not be made active until all units have been re-entered to the authorization table preventing units that should be on the list from being locked out of the system. The STATUS command format is as follows:

```

GRD> AUTH(cr)

AUTH> STAT(cr)
AUTHORIZATION INACTIVE
ACTIVATE AUTHORIZATION LIST (Y/N)? Y(cr)

AUTH> STAT(cr)
AUTHORIZATION ACTIVE
ACTIVATE AUTHORIZATION LIST (Y/N)? N(cr)

AUTH> QUIT(cr)
INACTIVE USER LIST

GRD>

```

The status of the authorization list is given to the system manager when leaving the authorization command family.

4.1.6 PDIGIT Command

The PDIGIT command allows the system manager to specify a digit sequence dialed from a radio that is to be passed on to the TELCO office, but is to be ignored by the CIT. An authorization check or TELCO charge calculation is not

performed on the pre-digit sequence. A pre-digit sequence is required by some TELCO offices to be able to dial a toll call. An example of how to use the PDIGIT command follows:

```
GRD> AUTH(cr)
AUTH> PDIGIT(cr)
XXXXX: (cr)
XXXXX: (cr)
XXXXX: (cr)
XXXXX: (cr)
XXXXX: (cr)
AUTH> PDIGIT(cr)
XXXXX: 123(cr)
XXXXX: 31(cr)
XXXXX: 471(cr)
XXXXX: (cr)
XXXXX: (cr)
AUTH> PDIGIT(cr)
123: (cr)
31: X(cr)
471: (cr)
XXXXX: (cr)
XXXXX: 789(cr)
AUTH> PDIGIT(cr)
123: (cr)
XXXXX: (cr)
471: (cr)
XXXXX: (cr)
789: (cr)
AUTH> QUIT(cr)

ACTIVE USER LIST
GRD>
```

An explanation of the listing follows:

When the system is first installed or after a loss of memory, the pre-digit table is blank. A blank entry is indicated by a series of X's. This table has capacity for up to 5 pre-digit sequences with up to 5 digits for each sequence. Entering a (cr) after a line output causes the program to advance to the next sequence without modifying the current pre-digit sequence. A pre-digit sequence is modified by entering the sequence as shown. A pre-digit sequence is deleted by entering a X as shown. This command cannot be terminated with the Quit commands until all five sequences are listed.

4.1.7 RESET Command

The RESET command causes authorization table, billing, call records and nearby area code exchanges entries to be cleared, setting these functions to the same state as when power was first applied to the system. Authorization and billing data bases should then be initialized. An example of the command is as follows:

```
GRD> AUTH(cr)
AUTH> RESET(cr)
CLEAR ALL AUTHORIZATION & BILLING DATA, ARE YOU SURE (Y/N)? Y(cr)
AUTHORIZATION & BILLING RESET
AUTH>
```

NOTE

The RSET sub-command of the BILL command can be used in conjunction with the Reset command to retrieve parts of the previously entered billing information without re-entering the billing information by using the INIT command. The RSET command, in this case, is used after the Reset command as shown in the Rset command paragraph.

4.1.8 UPDATE Command

The UPDATE command updates the master authorization table with the changes stored in the temporary Add and Delete tables. This command should be used after additions or deletions have been made before the List or other commands are given. Otherwise, the changes are made to the master authorization table when the user leaves the AUTH subsystem. An example of the command is as follows:

```
GRD> AUTH(cr)
AUTH> UPD(cr)
AUTH>
```

Changes caused by the Add and Delete commands are stored in a temporary memory area to make access to the master table faster. The records are stored in the master table in a sorted fashion. When the user leaves AUTH or issues the Update command, the records are moved into the proper locations in the master table. This is usually done only once during each session to reduce processing of the table.

4.1.9 QUIT Command

The QUIT command exits from AUTH. Control is returned to the GRD> prompt. This command automatically updates the master authorization table with Add and Delete temporary tables.

4.2 BILL COMMAND

The BILL command family provides the system manager with commands necessary to initially enter and subsequently list and modify parameters used by the CIT to generate airtime and TELCO charges. Summary commands are provided for the purpose of listing airtime charges, TELCO charges and long distance/toll call records for each authorized user of the system. The BILL command formats are as follows:

Command	Section	Description
AEXC	4.2.8	Add additional exchanges and nearby area codes to billing parameters
CLNG	4.2.12	Summarize logged calls listing - computer format
DEXC	4.2.9	Delete exchanges and entire area codes from billing parameters
GRDD	4.2.16	Save/restore memory information to/from tape
INIT	4.2.1	Initialize airtime and TELCO charge parameters
LAIR	4.2.2	List airtime charge parameters
LEXC	4.2.4	List exchange rate parameters
LOGN	4.2.13	Log long distance calls only
LOGY	4.2.13	Log all calls
LTEL	4.2.3	List TELCO charge parameters
MAIR	4.2.5	Modify airtime charge parameters
MEXC	4.2.7	Modify exchange rate parameters
MTEL	4.2.6	Modify TELCO charge parameters
PBXN	4.2.14	Remove Special Call Processing
PBXY	4.2.14	Establish Special Call Processing
QUIT	4.2.17	Exit to GUARDIAN prompt GRD<
RSET	4.2.15	Enable or disable airtime and TELCO charge calculation
SAIR	4.2.10	Summarize airtime charge listing
SLNG	4.2.12	Summarize logged calls listing
STEL	4.2.11	Summarize TELCO charge listing

The billing command family is accessed through the BILL command as shown in the following examples:


```

GRD> BILL(cr)
BILL> INIT(cr)
BILL> MAIR(cr)
BILL> QUIT(cr)
GRD>

```

NOTE

An attempt to use a routine other than INIT when the system is first turned on, after a loss of memory, or in the DEFAULT mode results in the message "MUST USE 'INIT' COMMAND FIRST" being output to the operator. An attempt to output charge summaries (CLNG, SAIR, STEL, SLNG) before both the Authorization and Billing Defaults are cleared (Status set to active state) results in the message "MUST SET AUTH & BILL ACTIVE FIRST" being output to the operator.

4.2.1 INIT Command

The INIT command enters those system parameters required by the CIT to calculate charges for airtime and local calls. The command is to be executed once after the system is first turned on or after a loss of memory or after RESET command. The AEXC, DEXC, MAIR, MTEL and MEXC commands are used to modify data entered with the INIT command.

Before using the INIT command, the system manager should choose a billing method for airtime and TELCO charge calculation. The different methods available in the CIT are identified and explained in detail through the following examples. Note: Due to the large number of data entries, the INIT command can be suspended at any time by entering Q instead of requested data input. Upon subsequent entering the INIT command, the system manager is prompted with a message that permits the INIT program to be restarted at the suspension point.

Examples of how to use the INIT command follow. The first example (Example 13) is for a flat method of calculating airtime and TELCO charges.

An explanation of the listing follows:

- Airtime billing method - Two different types of billing methods can be specified (Flat, Variable).

Flat - Flat billing results in a set amount per minute being charged for airtime regardless of the time of day or the day of the week.

Variable - Variable billing method gives the system manager the ability to specify charges based on the time of day or the day of the week. An example of the variable method is given later.

- Start date - The billing start date specifies the billing period for airtime charges. Note: The number 28 is the largest number that can be specified since February usually has only 28 days.
- Tax rate - Tax rate in % (federal, state plus local) that would apply to airtime charges.
- Minimum fee - Minimum airtime charge billed per user regardless of actual airtime used.
- Airtime rate - Charge per minute for interconnect type calls.
- TELCO billing method - Three different types of billing methods are available (Flat, Metered, or Variable) to provide the system manager with the flexibility of selecting the method that most closely matches that of the local TELCO office.

Flat - TELCO offices that bill using a flat method charge a fixed amount per month for local call service regardless of the number of calls made or the length of the calls.

Metered - TELCO offices bill a fixed amount per local call in addition to a basic service charge for metered service.

Example 13.

```
GRD> BILL(cr)
BILL> INIT(cr)
ENTER THE REQUESTED AIRTIME BILLING INFORMATION.
BILLING METHOD (FLAT/VARIABLE)? FLAT(cr)
BILLING START DATE (01-28)? 1(cr)
TAX RATE (XX.XX)? 1.00(cr)
MINIMUM FEE (XXX.XX)? 5.00(cr)
AIRTIME RATE (X.XX)/MIN? 0.25(cr)
ENTER THE REQUESTED TELCO BILLING INFORMATION.
BILLING METHOD (FLAT/METERED/VARIABLE)? FLAT(cr)
BILLING START DATE (01-28)? 15(cr)
FIXED MONTHLY TELCO FEE, LESS TAX (XXXX.XX)? 37.29(cr)
LOCAL CALL LIMIT: LEVEL 1 (XXX.XX)? 5.00(cr)
LOCAL CALL LIMIT: LEVEL 2 (XXX.XX)? 25.00(cr)
LOCAL CALL LIMIT: LEVEL 3 (XXX.XX)? 50.00(cr)
LOCAL CALL LIMIT: LEVEL 4 (XXX.XX)? 100.00(cr)
FEDERAL TAX RATE (X.XX)? 2.50(cr)
STATE TAX RATE (X.XX)? 5.25(cr)
LOCAL TAX RATE (X.XX)? 3.75(cr)
LOCAL AREA CODE (XXX)? 312(cr)
FEDERAL TAX ON CALLS TO THIS AREA CODE (Y/N)? N(cr)
STATE TAX ON CALLS TO THIS AREA CODE (Y/N)? Y(cr)
LOCAL TAX ON CALLS TO THIS AREA CODE (Y/N)? Y(cr)
ENTER ALL FREE EXCHANGES WITHIN THIS AREA CODE.
HIT (CR) TO QUIT.
EXCHANGE (XXX)? 376(cr)
EXCHANGE (XXX)? 359(cr)
EXCHANGE (XXX)? 339(cr)
EXCHANGE (XXX)? (cr)
ENTER NEARBY AREA CODES WITH FREE EXCHANGES.
HIT (CR) TO QUIT.
NEARBY AREA CODE (XXX)? 315(cr)
ENTER ALL FREE EXCHANGES WITHIN THIS AREA CODE.
HIT (CR) TO QUIT.
EXCHANGE (XXX)? (cr)
ENTER NEARBY AREA CODES WITH FREE EXCHANGES.
HIT (CR) TO QUIT.
NEARBY AREA CODE (XXX)? (cr)
USE 'INIT' INPUT TO CALCULATE BILLING CHARGES (Y/N)? Y(cr)

BILL> Q(cr)
GRD>
```

Variable - TELCO offices bill a variable amount per local call based on call length and exchange dialed.

- Start date - The start date for TELCO charges should coincide with the billing date of the TELCO office.
- TELCO fee - All basic service charges assessed by the TELCO office that are to be spread among all users of the system.
- Local call limit - Up to 4 local call limit levels can be specified for the system. These levels establish a credit level for each authorized user of the system. A user who exceeds the assigned call limit level is not allowed to make further calls until the call limit is increased.
- Tax rate - Tax rate in % to be applied to TELCO charges.
- Area code - Area code of the TELCO office that provides phone line service to the CIT terminal.
- Free exchanges - The system manager must specify those exchanges that are covered by the basic TELCO service charges for the flat method of billing. Calls to exchanges not specified as free exchanges are treated as toll calls. No TELCO charges are calculated for toll calls by the CIT. A record of the number dialed and the unit ID is saved in memory to be listed out with the CLNG or SLNG commands. (Note: A particular nearby area code can only be entered once with the INIT command. If all the exchanges were not entered for a particular area code, the AEXC command must be used after completing the INIT command sequence.)

A second example (Example 14) of the usage of the INIT command is for variable airtime billing and metered TELCO billing.

An explanation of the listing follows:

Airtime billing method - See explanation given in the first example (Example 13)
Start date - of the usage of the INIT command.
Tax rate -
Minimum fee -

- Free minutes - Equals the number of initial airtime minutes per month per user that are not billed.
- Airtime rate - Up to six different system rates can be specified for airtime charge calculation. The rates are used by the CIT to calculate airtime charges based upon the hour of the day in which the call was made. The default value for a rate is \$0.00.
- Rate choices - An airtime rate (1-6) is specified for each hour of the day for the time periods of weekdays and weekends.

TELCO billing method - See explanation in the first example (Example 13) of the
Start date - usage of the INIT command.
TELCO fee -
Local call limit -
Tax rate -

- Metered call charges - Fixed per call charge applied to those exchanges specified as being metered.
- Free exchanges - List of all exchanges that are not billed.
- Metered exchanges - List of all exchanges that are to be billed per the specified metered rate. Exchanges that are not specified as free or metered are treated as toll calls.

NOTE

A particular nearby area code can only be entered once with the INIT command. If all the exchanges were not entered for a particular area code, the AEXC command must be used after completing the INIT command sequence.

A third example (Example 15) of the usage of the INIT command is for flat airtime billing and variable TELCO billing.

An explanation of the listing follows:

Airtime billing method - See explanation given in the first example (example 13)
Start date - of the usage of the INIT command.
Tax rate -
Minimum fee -
Airtime rate -

TELCO billing method - See explanation given in the first example (example 13)
Start date - of the usage of the INIT command.
TELCO fee -
Local call limit -
Tax rate -

- Unit charge - A unit of measure of telephone service used by the TELCO office to charge for dialed local calls. The distance to the dialed exchange and the duration of the call determine the number of units charged to a call. The unit charge is the rate set by the TELCO office for this basic unit of service. (Note: the entry for unit charge is in cents.)
- Initial billing period - The initial billing period specified the minimum duration of a call for billing purposes only. The initial talking period is set by the billing rate structure of the TELCO office. Calls lasting longer than the initial talk period are billed for overtime charges.
- Thereafter time period - The thereafter time period specifies the minimum overtime charge period in minutes for calls lasting longer than the initial billing period. The flexibility exists to specify different thereafter time periods based upon the number of units charges to the initial time period. An example table is given below.

Basic Charge	Initial Period	Thereafter Period	Overtime Charges
2, 3 Units	3 min.	2 min.	1 unit
4, 5, 6, 7 Units	3 min.	1 min.	1 unit
8, 9, 10 Units	3 min.	1 min.	2 units

- Rate for Area Code Exchanges (Exchange rates) - For each exchange between 200 and 999, the system manager is required to specify the initial and the thereafter unit charges. The initial unit charge specifies the number of units charges to a call for the initial TELCO billing period. The thereafter unit charge specifies the number of units charged to a call for each thereafter time period beyond the initial billing period. Entering a carriage return (cr) for the initial unit charge of a particular exchange causes all calls to that exchange to be treated as toll calls. No TELCO charges are calculated for toll calls by the CIT. A record of the number dialed and the radio unit ID is saved in memory to be listed out with the SLNG command.

NOTE

A particular nearby area code can only be entered once with the INIT command. If all the exchanges were not entered for a particular area code, the AEXC command must be used after completing the INIT command sequence.

- Billing - If the local area code uses exchanges that have a 1 or 0 as the second digit, e.g., 310-1234 or 408-1234, then set the exchange rate for exchange 300 to something other than TOLL (which is 15,15). (A unit rate of 15,15 is a default value that specifies that the exchange is a toll exchange.) Even if the exchange 300 is not used in the local area code, set exchange 300 to something like 01,00. Doing this allows any 7-digit number to be processed, if authorized as usual, no matter if the exchange "looks like" an area code. Dialing other area codes in this case is always preceded by a 1. TELCO credit card calls can be 7 or 10 digits past the initial 0. For 7-digit 0+ calls, the interconnect unit waits 10 seconds after entry of the 7th digit and then "cuts-through" the call, connecting the mobile to the land line.

If the local area code does not have any exchanges with a 0 or 1 in the 2nd digit position. or if 1 + dialing is not used, be sure to leave the exchange rate for exchange 300 = TOLL (15,15). Doing this allows for the automatic identification, by the interconnect unit, of local or long distance calls.

Example 14.

```

GRD> BILL(cr)
BILL> INIT(cr)
ENTER THE REQUESTED AIRTIME BILLING INFORMATION.
BILLING METHOD (FLAT/VARIABLE)? V(cr)
BILLING START DATE (01-28)? 1(cr)
TAX RATE (XX.XX)? 3.00(cr)
MINIMUM FEE (XXX.XX)? 5.00(cr)
FREE MINUTES (XXX)? 10(cr)
AIRTIME RATE 1 (X.XX)/MIN? .25(cr)
AIRTIME RATE 2 (X.XX)/MIN? .35(cr)
AIRTIME RATE 3 (X.XX)/MIN? .50(cr)
AIRTIME RATE 4 (X.XX)/MIN? 1.00(cr)
AIRTIME RATE 5 (X.XX)/MIN? .10(cr)
AIRTIME RATE 6 (X.XX)/MIN? .00(cr)
ENTER RATE CHOICES FOR WEEKDAY HOURS
HOUR 0 (1-6)? 6(cr)
HOUR 1 (1-6)? 6(cr)
HOUR 2 (1-6)? 5(cr)
HOUR 3 (1-6)? 5(cr)
....
....
HOUR 22 (1-6)? 1(cr)
HOUR 23 (1-6)? 1(cr)
ENTER RATE CHOICES FOR WEEKEND HOURS
HOUR 0 (1-6)? 1(cr)
HOUR 1 (1-6)? 1(cr)
HOUR 2 (1-6)? 1(cr)
HOUR 3 (1-6)? 1(cr)
....
....
HOUR 22 (1-6)? 1(cr)
HOUR 23 (1-6)? 1(cr)
ENTER THE REQUESTED TELCO BILLING INFORMATION.
BILLING METHOD (FLAT/METERED/VARIABLE)? N(cr)
BILLING START DATE (01-28)? 15(cr)
FIXED MONTHLY TELCO FEE, LESS TAX (XXXX.XX)? 37.29(cr)
LOCAL CALL LIMIT: LEVEL 1 (XXX.XX)? 5.00(cr)
LOCAL CALL LIMIT: LEVEL 2 (XXX.XX)? 25.00(cr)
LOCAL CALL LIMIT: LEVEL 3 (XXX.XX)? 50.00(cr)
LOCAL CALL LIMIT: LEVEL 4 (XXX.XX)? 100.00(cr)
FEDERAL TAX RATE (X.XX)? 2.50(cr)
STATE TAX RATE (X.XX)? 2.50(cr)
LOCAL TAX RATE (X.XX)? 2.50(cr)
CHARGE PER METERED CALL (XX.XX CENTS)? 45.00(cr)
LOCAL AREA CODE (XXX)? 312(cr)
FEDERAL TAX ON CALLS TO THIS AREA CODE (Y/N)? N(cr)
STATE TAX ON CALLS TO THIS AREA CODE (Y/N)? N(cr)
LOCAL TAX ON CALLS TO THIS AREA CODE (Y/N)? N(cr)
ENTER ALL FREE EXCHANGES WITHIN THIS AREA CODE.
HIT (CR) TO QUIT.

```

Example 14. (Continued)

```
EXCHANGE (XXX)? 578(cr)
EXCHANGE (XXX)? 359(cr)
EXCHANGE (XXX)? 839(cr)
EXCHANGE (XXX)? (cr)
ENTER ALL METERED EXCHANGES WITHIN THIS AREA CODE.
HIT (CR) TO QUIT.
EXCHANGE (XXX)? 390(cr)
EXCHANGE (XXX)? 554(cr)
EXCHANGE (XXX)? 857(cr)
EXCHANGE (XXX)? (cr)
ENTER NEARBY AREA CODES WITH FREE OR METERED EXCHANGES.
HIT (CR) TO QUIT.
NEARBY AREA CODE (XXX)? 815(cr)
FEDERAL TAX ON CALLS TO THIS AREA CODE (Y/N)? Y(cr)
STATE TAX ON CALLS TO THIS AREA CODE (Y/N)? Y(cr)
LOCAL TAX ON CALLS TO THIS AREA CODE (Y/N)? Y(cr)
ENTER ALL FREE EXCHANGES WITHIN THIS AREA CODE.
HIT (CR) TO QUIT.
EXCHANGE (XXX)? 540(cr)
EXCHANGE (XXX)? 459(cr)
EXCHANGE (XXX)? (cr)
ENTER ALL METERED EXCHANGES WITHIN THIS AREA CODE.
HIT (CR) TO QUIT.
EXCHANGE (XXX)? 353(cr)
EXCHANGE (XXX)? 728(cr)
EXCHANGE (XXX)? (cr)
ENTER NEARBY AREA CODES WITH FREE OR METERED EXCHANGES.
HIT (CR) TO QUIT.
NEARBY AREA CODE (XXX)? (cr)
USE 'INIT' INPUT TO CALCULATE BILLING CHARGES (Y/N)? Y(cr)
BILL> 2(cr)

GRD>
```

Example 15.

```
GRD> 3BILL(cr)
BILL> INIT(cr)
ENTER THE REQUESTED AIRTIME BILLING INFORMATION.
BILLING METHOD (FLAT/VARIABLE)? F(cr)
BILLING START DATE (01-28)? 1(cr)
TAX RATE (XX.XX)? 1.00(cr)
MINIMUM FEE (XXX.XX)? 5.00(cr)
AIRTIME RATE (X.XX)/MIN? .25(cr)
ENTER THE REQUESTED TELCO BILLING INFORMATION.
BILLING METHOD (FLAT/METERED/VARIABLE)? V(cr)
BILLING START DATE (01-28)? 15(cr)
FIXED MONTHLY TELCO FEE, LESS TAX (XXXX.XX)? 67.29(cr)
LOCAL CALL LIMIT: LEVEL 1 (XXX.XX)? 5.00(cr)
LOCAL CALL LIMIT: LEVEL 2 (XXX.XX)? 25.00(cr)
LOCAL CALL LIMIT: LEVEL 3 (XXX.XX)? 50.00(cr)
LOCAL CALL LIMIT: LEVEL 4 (XXX.XX)? 100.00(cr)
FEDERAL TAX RATE (X.XX)? 2.50(cr)
STATE TAX RATE (X.XX)? 5.25(cr)
LOCAL TAX RATE (X.XX)? 3.75(cr)
```


Example 15. (Continued)

```
UNIT CHARGE (XX.XX CENTS)? 3.29(cr)
INITIAL TELCO BILLING TIME PERIOD (X)MINS? 3(cr)
ENTER THEREAFTER TIME PERIOD FOR INITIAL UNIT CHARGE OF: 0 (X)MINS? 2(cr)
ENTER THEREAFTER TIME PERIOD FOR INITIAL UNIT CHARGE OF: 1 (X)MINS? 2(cr)
....
....
ENTER THEREAFTER TIME PERIOD FOR INITIAL UNIT CHARGE OF: 14 (X)MINS? 4(cr)
ENTER THEREAFTER TIME PERIOD FOR INITIAL UNIT CHARGE OF: 15 (X)MINS? 4(cr)
LOCAL AREA CODE (XXX)? 312(cr)
FEDERAL TAX ON CALLS TO THIS AREA CODE (Y/N)? N(cr)
STATE TAX ON CALLS TO THIS AREA CODE (Y/N)? N(cr)
LOCAL TAX ON CALLS TO THIS AREA CODE (Y/N)? N(cr)
ENTER THE RATES FOR THE FOLLOWING AREA CODE EXCHANGES.
HIT (CR) FOR UNKNOWN OR TOLL RATES. THE RATE WILL BE SET TO TOLL
EXCHANGE 200.
INITIAL UNITS (XX)? 2(cr)
THEREAFTER UNITS (XX)? 1(cr)
EXCHANGE 201.
INITIAL UNITS (XX)? 5(cr)
THEREAFTER UNITS (XX)? 2(cr)
EXCHANGE 202.
INITIAL UNITS (XX)? 15(cr)
THEREAFTER UNITS (XX)? 4(cr)
....
....
EXCHANGE 998.
INITIAL UNITS (XX)? 10(cr)
THEREAFTER UNITS (XX)? 3(cr)
EXCHANGE 999.
INITIAL UNITS (XX)? 2(cr)
THEREAFTER UNITS (XX)? 1(cr)
ENTER NEARBY AREA CODES WITH NONTOLL EXCHANGES.
HIT (CR) TO QUIT.
NEARBY AREA CODE (XXX)? 315(cr)
FEDERAL TAX ON CALLS TO THIS AREA CODE (Y/N)? Y(cr)
STATE TAX ON CALLS TO THIS AREA CODE (Y/N)? Y(cr)
LOCAL TAX ON CALLS TO THIS AREA CODE (Y/N)? Y(cr)
ENTER NONTOLL EXCHANGES AND THEIR RATES FOR THIS AREA CODE. HIT (CR) TO QUIT
EXCHANGE? (XXX) 455(cr)
INITIAL UNITS? (XX) 12(cr)
THEREAFTER UNITS? (XX) 3(cr)
EXCHANGE? (XXX) 459(cr)
INITIAL UNITS? (XX) 11(cr)
THEREAFTER UNITS? (XX) 3(cr)
EXCHANGE? (XXX) (cr)
ENTER NONTOLL EXCHANGES AND THEIR RATES FOR THIS AREA CODE. HIT (CR) TO QUIT
(cr)
USE 'INIT' INPUT TO CALCULATE BILLING CHARGES (Y/N)? Y(cr)
BILL> 3(cr)

GRD>
```

4.2.2 LAIR Command

The LAIR command provides the system manager with a list of parameters that are used by the CIT to calculate airtime charges for interconnect call types. These parameters were previously entered with the INIT command. CONTROL-X suspends the output and returns control to the billing prompt.

Example 16 shows how to use the LAIR command.

Example 16.

```

GRD> BILL(cr)
BILL> LAIR(cr)
THIS IS THE AIRTIME BILLING INFO FOR SYSTEM 153B
METHOD-VARIABLE
START DATE- 15
MINIMUM FEE-$ 5.00
FREE MINUTES - 5
AIRTIME RATE 1-$ .05
AIRTIME RATE 2-$ .10
AIRTIME RATE 3-$ .25
AIRTIME RATE 4-$ .85
AIRTIME RATE 5-$ 1.95
AIRTIME RATE 6-$ .00
WEEKDAY RATE NUMBERS

HOUR    0    1
HOUR    1    1
HOUR    2    1
HOUR    3    1
HOUR    4    1
HOUR    5    1
HOUR    6    2
HOUR    7    2
HOUR    8    2
HOUR    9    3
HOUR   10    3
HOUR   11    4
HOUR   12    5
HOUR   13    5
HOUR   14    5
HOUR   15    5
HOUR   16    4
HOUR   17    3
HOUR   18    3
HOUR   19    2
HOUR   20    2
HOUR   21    1
HOUR   22    1
HOUR   23    1
WEEKEND RATE NUMBERS

HOUR    0    6
HOUR    1    6
HOUR    2    6
HOUR    3    1
HOUR    4    1
HOUR    5    1
HOUR    6    1
HOUR    7    1
HOUR    8    1
HOUR    9    1
HOUR   10    2
HOUR   11    3
HOUR   12    3
HOUR   13    3
HOUR   14    4
HOUR   15    3
HOUR   16    3
HOUR   17    3
HOUR   18    2
HOUR   19    1
HOUR   20    1
HOUR   21    6
HOUR   22    6
HOUR   23    6
AIRTIME TAX RATE- 5.00%
BILL> 2(cr)
GRD>

```

An explanation of the listing follows:

- System number - 153B is replaced with the actual number of the system.
- Method - Flat or Variable.
- Start date - Day of the month that the billing period for airtime begins (1- 28).
- Minimum fee - Basic airtime charge each user pays irrespective of actual airtime used (\$0.00-\$999.99).
- Free minutes - Airtime period which is covered by the minimum fee charge (0- 999).
- Airtime rate - Up to 6 per minute airtime rates that range in value from \$0.00 to \$9.99 can be specified.
- Weekday rate numbers - For each hour of a weekday (Monday through Friday) an airtime rate from 1-6 is specified. The actual value of this rate (1-6) is specified in the airtime rate table.
- Weekend rate numbers - For each hour of a weekend day (Saturday and Sunday) an airtime rate from 1-6 is specified. The actual value of this rate (1-6) is specified in the airtime rate table.
- Airtime tax rate - Tax rate to be applied to airtime charges.

4.2.3 LTEL Command

The LTEL command provides the system manager with a list of parameters that are used by the CIT to calculate TELCO charges for interconnect call types. These parameters were previously entered using the INIT command. CONTROL-X suspends the output and returns control to the billing prompt.

Example 17 shows how to use the LTEL command.

Example 17.

```
GRD> BILL(cr)
BILL> LTEL(cr)
THIS IS THE TELCO BILLING INFO FOR SYSTEM 153B
METHOD-VARIABLE
START DATE- 1
FIXED MONTHLY FEE $ 75.00
LOCAL CALL LIMIT: LEVEL 1-$ 10.00
LOCAL CALL LIMIT: LEVEL 2-$ 50.00
LOCAL CALL LIMIT: LEVEL 3-$ 100.00
LOCAL CALL LIMIT: LEVEL 4-$ 999.00
UNIT CHARGE 5.29 CENTS
FEDERAL TAX 1.00%
STATE TAX 2.00%
LOCAL TAX 3.15%
INITIAL BILLING TIME PERIOD (MIN) 3
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 0 2
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 1 2
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 2 2
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 3 2
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 4 1
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 5 1
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 6 1
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 7 1
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 8 1
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 9 1
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 10 1
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 11 1
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 12 1
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 13 1
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 14 1
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 15 1
BILL> Q(cr)
GRD>
```


An explanation of the listing follows:

- System number - 153B is replaced with the actual number for the system.
- Method - Flat, Metered or Variable.
- Start date - day of the month that the billing period for the TELCO charges begin (1-28).
- Fixed monthly fee - Monthly TELCO charges for basic phone line termination (\$0-9999.99).
- Local call limit - Up to 4 local call limit levels can be specified. Each authorized user is assigned a call limit level from 1-4. A user who exceeds the assigned call limit level will not be allowed to make further calls until the call limit level is increased (\$0-999.99).
- Unit charge - TELCO charges assigned to a unit which is defined to be a measure of telephone service used in the calculation of charges for dialed local calls. Phone exchange and the length of the call determine the number of units charged.
- Federal, State and Local tax - Tax rates to be applied to TELCO charges.
- Initial billing period - The minimum billing period in minutes used by the TELCO office to calculate charges for local calls. For example, a 1 minute local call to a TELCO office with a 3 minute minimum is billed as a 3 minute call.
- Thereafter time period - The minimum billing period in minutes for that time in excess of the initial billing period used by the TELCO office to calculate charges for local calls. The minimum billing period may vary depending on the distance of the exchange called. The multiple entry table provides the required flexibility (0-9 minutes).

4.2.4 LEXC Command

The LEXC command provides the system manager with a list of TELCO exchange rates that are used by the CIT to calculate TELCO charges or local interconnect call types. These parameters were previously entered using the INIT command. CONTROL-X suspends the output and returns control to the billing prompt.

Example 18 shows how to use the LEXC command.

An explanation of the listing follows:

- System number - 153B is replaced with the actual number for the system.
- Area Code (i.e., 312) - Area code of the TELCO office that provides phone line service to the CIT terminal. The area code changes depending on system location.
- Federal, State Local tax - Y-tax is to be included in the calculation of charges, N-tax is ignored. The actual tax rates can be listed with the LTEL command.
- Local exchange rates - Listing of the units for all possible TELCO exchanges from 200 to 999 for local calls. For example, the unit rate for exchange 203 is 06,02. The 06 specifies the number of units charges for the initial billing time period. The 02 specifies the number of units charged for the thereafter time periods. The unit charge, initial billing time period and thereafter time period can be listed with the LTEL command. A unit rate of 15,15 is a default value that specifies the exchange is a toll call exchange.
- Area code (i.e., 414, 815) - The exchanges listed for these area codes are treated as local calls for billing purposes by the TELCO office.

4.2.5 MAIR Command

The MAIR command provides the system manager with the means to modify airtime billing parameters. These parameters were previously entered with the INIT command. For each parameter line output, the system manager must enter a (cr) to leave the parameter unchanged, a data stream to modify the parameter, or a Q to exit the routine and return to the billing prompt. The changes can be verified with the LAIR command.

Example 18.

```
GRD> BILL(cr)
BILL> LEXC(cr)
THIS IS THE EXCHANGE RATE INFO FOR SYSTEM 1538
AREA CODE - 312
FEDERAL TAX NO
STATE TAX NO
LOCAL TAX NO
LOCAL AREA CODE EXCHANGE RATES:
EXCH  0      1      2      3      4      5      6      7      8      9
-----
200 03,01 02,01 03,01 06,02 01,01 00,00 02,01 03,01 10,02 15,05
210 09,03 03,01 04,02 00,00 04,01 06,02 01,00 05,01 11,03 01,00
990 01,01 03,01 09,02 10,01 12,02 02,01 04,01 01,00 00,00 00,00

END OF RETRIEVAL

AREA CODE - 414
FEDERAL TAX YES
STATE TAX NO
LOCAL TAX NO
EXCHANGE RATES -
576 01,00
872 06,00
415 04,01
690 01,01

END OF RETRIEVAL

AREA CODE - 815
FEDERAL TAX YES
STATE TAX YES
LOCAL TAX YES
EXCHANGE RATES -
892 03,01
668 02,01

END OF RETRIEVAL

BILL> Q(cr)
GRD>
```

Example 19 shows how to use the MAIR command.

The method, start date, free minutes, airtime rate 4, weekday hour 4 and weekday hour 6 parameters remain unchanged. The other parameters were changed as shown per indicated values.

4.2.6 MTEL Command

The MTEL command provides the system manager with the means to modify TELCO billing parameters. These parameters were previously entered with the INIT command. For each parameter line output, the system manager must enter a (cr) to leave the parameter unchanged, a data stream to modify the parameter, or a Q to exit the routine and return to the billing prompt. The changes can be verified with the LTEL command.

Example 20 shows how to use the MTEL command.

The method, start date, local call limit levels 1 and 2, unit charge, federal and state tax, initial billing time period and thereafter time period for initial unit charge of 1 and 3 minutes remain unchanged. The other parameters were changed as shown per indicated values.

Example 19.

```
GRD> BILL(cr)
BILL> AIR(cr)
THIS IS THE AIRTIME BILLING INFO FOR SYSTEM 1538
METHOD-VARIABLE: (cr)
START DATE- 1: (cr)
MINIMUM FEE-$ 7.50: 8.00(cr)
FREE MINUTES - 6: (cr)
AIRTIME RATE 1-$ .25: .00(cr)
AIRTIME RATE 2-$ .35: .25(cr)
AIRTIME RATE 3-$ .45: .35(cr)
AIRTIME RATE 4-$ .55: (cr)
AIRTIME RATE 5-$ .75: .85(cr)
AIRTIME RATE 6-$ .00: 1.00(cr)
WEEKDAY RATE NUMBERS
HOUR 0 6: 1(cr)
HOUR 1 6: 1(cr)
HOUR 2 6: 1(cr)
HOUR 3 6: 2(cr)
HOUR 4 2: (cr)
HOUR 5 3: 2(cr)
HOUR 6 2: 2(cr)
BILL> Q(cr)
GRD>
```

Example 20.

```
GRD> BILL(cr)
BILL> TEL(cr)
THIS IS THE TELCO BILLING INFO FOR SYSTEM 1538
METHOD-VARIABLE: (cr)
START DATE- 1: (cr)
FIXED MONTHLY FEE $ 67.29: 59.66(cr)
LOCAL CALL LIMIT: LEVEL 1-$ 8.00: (cr)
LOCAL CALL LIMIT: LEVEL 2-$ 25.00: (cr)
LOCAL CALL LIMIT: LEVEL 3-$ 100.00: 50.00(cr)
LOCAL CALL LIMIT: LEVEL 4-$ 999.00: 75.00(cr)
UNIT CHARGE 5.29 CENTS: (cr)
FEDERAL TAX 1.00%: (cr)
STATE TAX 2.00%: (cr)
LOCAL TAX 3.20%: 3.30(cr)
INITIAL BILLING TIME PERIOD (MIN) 3: (cr)
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 0 1: 2(cr)
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 1 2: (cr)
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 2 2: 1(cr)
THEREAFTER TIME PERIOD (MIN) FOR INITIAL UNIT CHARGE OF 3 2: Q(cr)
BILL> Q(cr)
GRD>
```

4.2.7 MEXC Command

The MEXC command provides the system manager with the means to modify exchange rate billing parameters. These parameters were previously entered with the INIT command. For each parameter line output, the operator must enter a (cr) to leave the parameter unchanged, a data stream to modify the parameter, or a Q to exit the routine and return to the billing prompt. The changes can be verified with the LEXC command.

Example 21 shows how to use the MEXC command.

Each exchange to be modified in the local area code must be specified. Entering a (cr) after "INITIAL UNITS (XX)?" or "THEREAFTER UNITS (XX)?" will result in the parameter being unchanged. Entering a (cr) after an "EXCHANGE (XXX)?" in the local area code causes the program to advance to the nearby area code exchanges. Modification of an exchange in the nearby area code is accomplished by cycling through all the exchanges for each of the nearby area code. Entering a Q causes the routine to exit to the billing prompt.

Example 21.

```
GRD> BILL(cr)
BILL> AEXC(cr)
THIS IS THE EXCHANGE RATE INFO FOR SYSTEM 0509
AREA CODE - 312: (cr)
FEDERAL TAX NO: (cr)
STATE TAX NO: (cr)
LOCAL TAX NO: (cr)
LOCAL AREA CODE EXCHANGE RATE MODIFICATIONS -
ENTER EXCHANGE TO MODIFY OR JUST HIT RETURN TO QUIT
IF PRESENT EXCHANGE RATE IS CORRECT, JUST HIT RETURN, ELSE ENTER NEW RATE
EXCHANGE (XXX)? 809(cr)
08,09
INITIAL UNITS (XX)? (cr)
THEREAFTER UNITS (XX)? (cr)
EXCHANGE (XXX)? 456(cr)
15,15
INITIAL UNITS (XX)? (cr)
THEREAFTER UNITS (XX)? (cr)
EXCHANGE (XXX)? 201(cr)
02,01
INITIAL UNITS (XX)? (cr)
THEREAFTER UNITS (XX)? (cr)
EXCHANGE (XXX)? : (cr)

END OF RETRIEVAL

NEARBY AREA CODE EXCHANGE RATE MODIFICATIONS -
IF PRESENT EXCHANGE RATE IS CORRECT, JUST HIT RETURN, ELSE ENTER NEW RATE
AREA CODE - 815: (cr)
FEDERAL TAX YES: (cr)
STATE TAX YES: (cr)
LOCAL TAX YES: (cr)
EXCHANGE RATES -
455 00,00
INITIAL UNITS (XX)? (cr)
THEREAFTER UNITS (XX)? (cr)
459 00,00
INITIAL UNITS (XX)? (cr)
THEREAFTER UNITS (XX)? (cr)
653 01,00
INITIAL UNITS (XX)? (cr)
THEREAFTER UNITS (XX)? (cr)
984 01,00
INITIAL UNITS (XX)? (cr)
THEREAFTER UNITS (XX)? (cr)

END OF RETRIEVAL

AREA CODE - 818: (cr)
FEDERAL TAX YES: (cr)
STATE TAX YES: (cr)
LOCAL TAX YES: (cr)
EXCHANGE RATES -
455 09.09
INITIAL UNITS (XX)? (cr)
THEREAFTER UNITS (XX)? (cr)

END OF RETRIEVAL

BILL>
```

4.2.8 AEXC Command

The AEXC command allows the system manager to add additional exchanges and nearby area codes to the TELCO billing exchange tables. The INIT command was used by the system manager to initially create the exchange tables. The following examples demonstrate the use of this command. The first example (Example 22) applies to a system that has been set up for a flat TELCO billing method.

Example 22.

```
GRD> BILL(cr)
BILL> AEXC(cr)
ENTER AREA CODE (XXX)? 312(cr)
ENTER ALL EXCHANGES WITHIN THIS AREA CODE.
HIT (CR) TO QUIT.
EXCHANGE (XXX)? 333(cr)
INITIAL UNITS (XX)? 1(cr)
THEREAFTER UNITS (XX)? 1(cr)
EXCHANGE (XXX)? 576(cr)
INITIAL UNITS (XX)? 1(cr)
THEREAFTER UNITS (XX)? 1(cr)
EXCHANGE (XXX)? (cr)
ENTER AREA CODE (XXX)? 815(cr)
ENTER NONTOLL EXCHANGES AND THEIR RATES FOR THIS AREA CODE.
HIT (CR) TO QUIT.
EXCHANGE (XXX)? 344(cr)
INITIAL UNITS (XX)? 1(cr)
THEREAFTER UNITS (XX)? 1(cr)
ENTER NONTOLL EXCHANGES AND THEIR RATES FOR THIS AREA CODE.
HIT (CR) TO QUIT.
EXCHANGE (XXX)? (cr)
ENTER AREA CODE (XXX)? (cr)
BILL> Q(cr)
GRD>
```

Free exchanges 333 and 576 were added to the 312 area code exchange list, and exchange 344 was added to the 815 list. The second example (Example 23) shows the addition of exchanges for a new area code.

Entering a (cr) after "EXCHANGE (XXX)?" causes the program to advance to the next step of requesting additional area codes. Entering a (cr) after ENTER AREA CODE (XXX)? causes the program to exit to the billing prompt. Entering a Q causes the program to exit to the billing prompt.

The second example (Example 23) applies to a system that has been set up for a metered TELCO billing method.

Example 23.

```
GRD> BILL(cr)
BILL> AEXC(cr)
ENTER AREA CODE (XXX)? 312(cr)
ENTER ALL FREE EXCHANGES WITHIN THIS AREA CODE.
HIT (CR) TO QUIT.
EXCHANGE (XXX)? 333(cr)
EXCHANGE (XXX)? 576(cr)
EXCHANGE (XXX)? (cr)
ENTER ALL METERED EXCHANGES WITHIN THIS AREA CODE.
HIT (CR) TO QUIT.
EXCHANGE (XXX)? 523(cr)
EXCHANGE (XXX)? (cr)
ENTER AREA CODE (XXX)? 414(cr)
FEDERAL TAX ON CALLS TO THIS AREA CODE (Y/N)? Y(cr)
STATE TAX ON CALLS TO THIS AREA CODE (Y/N)? N(cr)
LOCAL TAX ON CALLS TO THIS AREA CODE (Y/N)? Y(cr)
ENTER ALL FREE EXCHANGES WITHIN THIS AREA CODE.
HIT (CR) TO QUIT.
EXCHANGE (XXX)? 458(cr)
EXCHANGE (XXX)? (cr)
ENTER ALL METERED EXCHANGES WITHIN THIS AREA CODE.
HIT (CR) TO QUIT.
EXCHANGE (XXX)? 390(cr)
EXCHANGE (XXX)? 357(cr)
EXCHANGE (XXX)? (cr)
ENTER AREA CODE (XXX)? (cr)
BILL> Q(cr)
GRD>
```

Entering a new area code results in questions on taxes being asked of the system manager.

The third example (Example 24) applies to a system that has been set up for a variable TELCO billing method.

Example 24.

```
GRD> BILL(cr)
BILL> AEXC(cr)
ENTER AREA CODE (XXX)? 312(cr)
ENTER ALL EXCHANGES WITH THIS AREA CODE.
HIT (CR) TO QUIT.
EXCHANGE (XXX)? 453(cr)
INITIAL UNITS (XX)? 3(cr)
THEREAFTER UNITS (XX)? 4(cr)
EXCHANGE (XXX)? (cr)
ENTER AREA CODE (XXX)? 303(cr)
FED TAX ON CALLS TO THIS AREA CODE (Y/N)? Y(cr)
STATE TAX ON CALLS TO THIS AREA CODE (Y/N)? N(cr)
LOCAL TAX ON CALLS TO THIS AREA CODE (Y/N)? Y(cr)
ENTER NONTOLL EXCHANGES AND THEIR RATES FOR THIS AREA CODE. HIT (CR) TO QUIT.
EXCHANGE (XXX)? 458(cr)
INITIAL UNITS (XX)? 12(cr)
THEREAFTER UNITS (XX)? 3(cr)
EXCHANGE (XXX)? (cr)
ENTER AREA CODE (XXX)? (cr)
BILL>
```

NOTE

The maximum number of units that can be specified for initial and thereafter time periods is 15. The minimum is zero.

4.2.9 DEXC Command

The DEXC command allows the system manager to delete entire area codes (excluding the local area code) or specific exchanges (excluding exchanges within the local area code table) from the billing exchange tables. The MEXC command is used to delete or modify exchanges for the local area code. An example of how to use the DEXC command follows:

```
GRD> BILL(cr)
BILL> DEXC(cr)
ENTER AREA CODE (XXX)? 815(cr)
DELETE THIS AREA CODE (Y/N)? N(cr)
EXCHANGE (XXX)? 344(cr)
EXCHANGE (XXX)? (cr)
ENTER AREA CODE (XXX)? (cr)
BILL>
```

Exchange 344 was deleted from area code 815 in this example. Answering Y to the question DO YOU WISH TO DELETE THIS AREA CODE (Y/N)? would have resulted in all exchanges for area code 815 being deleted. Entering a (cr) after "EXCHANGE (XXX)?" causes the program to advance to the next step of requesting additional area codes. Entering a (cr) after ENTER AREA CODE? (XXX) causes the program to exit to the billing prompt. Entering a Q causes the program to exit to the billing prompt.

4.2.10 SAIR Command

The SAIR command provides the system manager with a listing of airtime charges for the current or previous billing periods. The system manager is given the choice of specifying the listing of airtime charges for the entire system, for a talk group ID, for a unit or range of units, or customer group. CONTROL-X suspends the output and returns control to the billing prompt BILL>. Entering a Q for billing period returns control to the billing prompt.

An example of the command function follows:

```
GRD> BILL(cr)
BILL> SAIR(cr)
BILLING PERIOD (THIS/LAST) ? T(cr)
GROUP, TYPE II ID RANGE, ID, TALK GP, FLT IND, OR ALL
Gxxx, Ixxxxxx-Ixxxxxx, Ixxxxxx, Txxxxxx , xxx xxx, OR (CR) : I757345-I757349(cr)

AIRTIME CHARGE FROM 1- 1 THRU 1-15 FOR ID I757345-I757349 FOR SYSTEM 0B05
-----
CUSTOMER UNIT   AIRTIME   FIXED   ADDITIONAL
GROUP   ID      MIN.SEC   CHARGE   CHARGE      TAX      TOTAL
-----
  100   I757345      .00     1.99      .00      .03      2.02
  100   I757346      .00     1.99      .00      .03      2.02
  100   I757347      .00     1.99      .00      .03      2.02
  100   I757348      .00     1.99      .00      .03      2.02
  100   I757349     7.43     1.99      7.67      .19      9.85
-----

BILL> SAIR(cr)
BILLING PERIOD (THIS/LAST) ? T(cr)
GROUP, TYPE II ID RANGE, ID, TALK GP, FLT IND, OR ALL
Gxxx, Ixxxxxx-Ixxxxxx, Ixxxxxx, Txxxxxx , xxx xxx, OR (CR) : 600 1(cr)

AIRTIME CHARGE FROM 1- 1 THRU 1-15 FOR ID 0001 FOR SYSTEM 0B05
-----
CUSTOMER UNIT   AIRTIME   FIXED   ADDITIONAL
GROUP   ID      MIN.SEC   CHARGE   CHARGE      TAX      TOTAL
-----
  600    001      .00     1.99      .00      .03      2.02
-----

BILL> SAIR(cr)
BILLING PERIOD (THIS/LAST) ? T(cr)
GROUP, TYPE II ID RANGE, ID, TALK GP, FLT IND, OR ALL
Gxxx, Ixxxxxx-Ixxxxxx, Ixxxxxx, Txxxxxx , xxx xxx, OR (CR) : G200(cr)
NOT ON GROUP LIST

BILL> SAIR(cr)
BILLING PERIOD (THIS/LAST) ? T(cr)
GROUP, TYPE II ID RANGE, ID, TALK GP, FLT IND, OR ALL
Gxxx, Ixxxxxx-Ixxxxxx, Ixxxxxx, Txxxxxx , xxx xxx, OR (CR) : G1(cr)
```

AIRTIME CHARGE FROM 1- 1 THRU 1-15 FOR GROUP 001 FOR SYSTEM 0B05

CUSTOMER GROUP	UNIT ID	AIRTIME MIN. SEC	FIXED CHARGE	ADDITIONAL CHARGE	TAX	TOTAL	
001	001	3.26	1.99	3.42	.10	5.51	
001	002	.00	1.99	.00	.03	2.02	
001	027	.00	1.99	.00	.03	2.02	
001	028	5.51	1.99	5.81	.15	7.95	
001	02C	.00	1.99	.00	.03	2.02	
001	02D	.00	1.99	.00	.03	2.02	
001	02E	.00	1.99	.00	.03	2.02	
001	02F	.00	1.99	.00	.03	2.02	
001	030	.00	1.99	.00	.03	2.02	
001	031	.00	1.99	.00	.03	2.02	
001	032	7.43	1.99	7.67	.19	9.85	
001	033	.00	1.99	.00	.03	2.02	
001	034	.00	1.99	.00	.03	2.02	
	13	17.00	25.87	16.90	.74	43.51	GROUP TOTAL

BILL> SAIR(cr)

BILLING PERIOD (THIS/LAST) ? I(cr)

GROUP, TYPE II ID RANGE, ID, TALK GP, FLT IND, OR ALL

Gxxx, Ixxxxxx-Ixxxxxx, Ixxxxxx, Txxxxxx, xxx xxx, OR (CR) : (cr)

AIRTIME CHARGE FROM 1- 1 THRU 1-15 FOR SYSTEM 0B05

CUSTOMER GROUP	UNIT ID	AIRTIME MIN. SEC	FIXED CHARGE	ADDITIONAL CHARGE	TAX	TOTAL	
001	001	3.26	1.99	3.42	.10	5.51	
001	002	.00	1.99	.00	.03	2.02	
001	027	.00	1.99	.00	.03	2.02	
001	028	5.51	1.99	5.81	.15	7.95	
001	02C	.00	1.99	.00	.03	2.02	
001	02D	.00	1.99	.00	.03	2.02	
001	02E	.00	1.99	.00	.03	2.02	
001	02F	.00	1.99	.00	.03	2.02	
001	030	.00	1.99	.00	.03	2.02	
001	031	.00	1.99	.00	.03	2.02	
001	032	7.43	1.99	7.67	.19	9.85	
001	033	.00	1.99	.00	.03	2.02	
001	034	.00	1.99	.00	.03	2.02	
13		17.00	25.87	16.90	.74	43.51	GROUP TOTAL
100	I757355	.00	1.99	.00	.03	2.02	
1		.00	1.99	.00	.03	2.02	GROUP TOTAL
600	I757356	.00	1.99	.00	.03	2.02	
600	I757357	.00	1.99	.00	.03	2.02	
2		.00	3.98	.00	.06	4.04	GROUP TOTAL
16		17.00	31.84	16.90	.83	49.57	SYSTEM TOTAL

BILL> SAIR(cr)

BILLING PERIOD (THIS/LAST) ? L(cr)

GROUP, TYPE II ID RANGE, ID, TALK GP, FLT IND, OR ALL

Gxxx, Ixxxxxx-Ixxxxxx, Ixxxxxx, Txxxxxx, xxx xxx, OR (CR) : (cr)

AIRTIME CHARGE FROM 7- 1 TO 7-31 FOR SYSTEM 153B						
CUSTOMER GROUP	UNIT ID	AIRTIME MIN. SEC	FIXED CHARGE	ADDITIONAL CHARGE	TAX	TOTAL
002	123	12.11	5.00	7.54	.10	12.64
002	124	8.50	5.00	5.62	.08	10.70
002	125	13.07	5.00	8.19	.11	13.30
002	T800001	6.40	5.00	3.98	.05	9.03
	4	40.48	20.00	25.33	.34	45.67 GROUP TOTAL
004	I757370	17.24	5.00	10.76	.14	15.90
	1	17.24	5.00	10.76	.14	15.90 GROUP TOTAL
	5	57.72	25.00	36.09	.48	61.57 SYSTEM TOTAL

BILL> SAIR(cr)
 BILLING PERIOD (THIS/LAST) ? T(cr)
 GROUP, TYPE II ID RANGE, ID, TALK GP, FLT IND, OR ALL
 Gxxx, Ixxxxxx-Ixxxxxx, Ixxxxxx, Txxxxxx , xxx xxx, OR (CR) : G3(cr)

AIRTIME CHARGE FROM 8- 1 THRU 8-10 FOR GROUP 002 FOR SYSTEM 153B						
CUSTOMER GROUP	UNIT ID	AIRTIME MIN. SEC	FIXED CHARGE	ADDITIONAL CHARGE	TAX	TOTAL
003	133	5.13	5.00	3.68	.06	8.74
003	134	2.11	5.00	1.36	.03	6.39
003	I757311	18.34	5.00	9.74	.16	14.90
	3	26.07	15.00	14.78	.25	30.03 GROUP TOTAL

BILL>

An explanation of the listing follows:

- System number - 153B is replaced with the actual number for the system.
- Billing period - L = billing period for the previous month, T = current billing period up to the current day.
- GROUP, TYPE II ID RANGE, ID, TALK GP, FLT IND, OR ALL Gxxx, Ixxxxxx-Ixxxxxx, Ixxxxxx, Txxxxxx , xxx xxx, OR (CR) - Enter a group number for information about an entire group, a range of Type II unit IDs to inclusively list only a portion of the IDs, a specific unit ID, a talk group ID for a specific talk group, an individual ID for a specific fleet, or, a (cr). A (cr) results in all applicable units and talk groups being listed.
- Airtime - The actual airtime in minutes and seconds for interconnect type call types for the billing period.
- Fixed charge - Fixed airtime charge independent of airtime used.
- Additional charge - Airtime charges that were calculated by the CIT based upon airtime used, time of day and day of week.

NOTE

The airtime charges for the previous billing period are saved for an entire billing period. For example, the charges calculated for the period of 5-1 to 6-1 are saved until the date of 7-1.

4.2.11 STEL Command

The STEL command provides the system manager with a listing of TELCO charges for the current or previous billing periods. The system manager is given the choice of specifying the listing of TELCO charges for the entire system, customer group or for a unit, talk group or range of units. CONTROL-X suspends the output and returns control to the billing prompt BILL>. Entering a Q for billing period returns control to the billing prompt.

An example of the command function follows:

```

BILL> STEL(cr)
BILLING PERIOD (THIS/LAST) ? T(cr)
GROUP, TYPE II ID RANGE, ID, TALK GP, FLT IND, OR ALL
Gxxx, Ixxxxxx-Ixxxxxx, Ixxxxxx, Txxxxxx , xxx xxx, OR (CR) : (cr)

LOCAL CALL CHARGE FROM 1- 1 THRU 1-15 FOR SYSTEM 0B05
-----
CUSTOMER UNIT      LOCAL      CALL      TAXES      TOTAL
GROUP  ID          CALLS    CHARGES  ST-LOC   FED    CHARGE
-----
  001    001         0        .07      .00      .00      .07
  001    002         0        .07      .00      .00      .07
  001    027         0        .07      .00      .00      .07
  001    028         0        .07      .00      .00      .07
  001    02C         0        .07      .00      .00      .07
  001    02D         0        .07      .00      .00      .07
  001    02E         0        .07      .00      .00      .07
  001    02F         0        .07      .00      .00      .07
  001    030         0        .07      .00      .00      .07
  001    031         0        .07      .00      .00      .07
  001    032         0        .07      .00      .00      .07
  001    033         0        .07      .00      .00      .07
  001    034         0        .07      .00      .00      .07
-----
          13         0        .91      .00      .00      .91  GROUP TOTAL
-----
  012  I757345         0        .00      .00      .00      .00
-----
          1         0        .00      .00      .00      .00  GROUP TOTAL
-----
  022  I757355         0        .00      .00      .00      .00
  022  I757356         0        .00      .00      .00      .00
-----
          2         0        .00      .00      .00      .00  GROUP TOTAL
-----
          16         0        .91      .00      .00      .91  SYSTEM TOTAL
-----
BILL>

```

An explanation of the listing follows:

- System number - 0B05 is replaced with the actual number for the system.
- Billing period - Last = billing period for the previous month, This = current billing period up to the current day.
- GROUP, TYPE II ID RANGE, ID, TALK GP, FLT IND, OR ALL Gxxx, Ixxxxxx-Ixxxxxx, Ixxxxxx, Txxxxxx , xxx xxx, OR (CR) - Enter a group number for information about an entire group, a range of Type II unit IDs to inclusively list only a portion of the IDs, a specific unit ID, a talk group ID for a specific talk group, an individual ID for a specific fleet, or, a (cr). A (cr) results in all applicable units and talk groups being listed.
- No. of local calls - Actual number of local interconnect calls made during the billing period.
- Call charges - TELCO charges for local calls that were calculated by the CIT based upon length of call and exchange dialed.
- Taxes - Taxes for call charges as calculated by the CIT.

NOTE

The TELCO charges for the previous billing period are saved for an entire billing period. For example, the charges calculated for the period of 5-1 to 6-1 are saved until the date of 7-1.

4.2.12 CLNG and SLNG Commands

The CLNG and SLNG commands provide the system manager with a means to extract billing information from the system. There are two distinct types of format. The first (SLNG) is a type that is meant for human use, in other words, human readable. The second (CLNG) is meant for input to a computer system and the data is sent in a compressed format that is very difficult for a human to read, but easier for a computer to use. Sections follow detailing features.

4.2.12.1 SLNG COMMAND

The SLNG command gives the system manager a report detailing long distance and toll calls made on the system, or, if logging is turned on, all calls made. The programs that produce these reports have limited memory space in which to store call records. On those systems with many interconnect users, it may be necessary to run this report and clear memory more frequently than once per month. CONTROL-X suspends the output and returns control to the billing prompt.

An example of the command function follows:

```
GRD> BILL(cr)
BILL> SLNG(cr)

LONG DISTANCE CALLS FROM 5- 2 THRU 5-02 FOR SYSTEM 153B
-----
GROUP  UNIT  DATE  TIME  MINUTES  NUMBER
-----
000    S01   9-28   747A    1    LAND    902048
001    123   6-07   917A    2      815-555-2478
001    123   6-21   1105P   5      815-555-4701
001    123   6-22   148P    3      419-555-5419
001  I757345  6-02   734A    3      309-555-5063
003  I757346  6-09   1050P   2      608-555-4728
003  I757346  6-21   1026A   4      509-555-3168
700  I757347  9-27   1116A    1    LAND    757347
-----
CLEAR LONG DISTANCE RECORDS (Y/N) ? N(cr)
BILL>
```

4.2.12.2 CLNG COMMAND (With Option D436 Only)

This form of the command provides output in a specific format for use by a computer that takes this data and post process it into other documents to be used for billing purposes. There are several important features of this mode. They are:

- A CRC check has been added to each individual call record so that it is easy for a receiving computer to determine if the record was received error free.
- Call records have been compressed so that transmission of the data can be accomplished in a much shorter time.
- An ENQ character is sent at the end of each record rather than a (cr). The upload computer should calculate the CRC for the received record and, if it agrees with the transmitted value, the computer should send an ACK character to the central controller, and the central controller will then send the next record. If the CRC calculation does not agree with the value received, the computer should send a NAK character and the central controller will resend the last record.

- A End of Transmission record is sent indicating the total number of records that were sent.

Following are details for 3 distinct types of records. The first is a header record that gives the system ID and date being reported. The second is the data records (one for each billing record). Last is a description of the closing record which indicates the end of the data and also tells how many records were transmitted in the batch.

----- HEADER RECORD -----

This is a 22 byte record that is composed of the following information:

BYTES	ASCII	HEX #	DEC #	DESCRIPTION
1-2	SYN	16	22	Synchronization characters
3	SOH	1	1	Start of header character
4	H	48	72	The ASCII character "H" for header record
5	STX	2	2	Start of text character
6-9	—	—	—	Start date in ASCII in the form MMDD
10-13	—	—	—	Ending date in ASCII in the form MMDD
14-17	—	—	—	System ID in ASCII (i.e. "0509")
18	ITB	1F	31	Unit separator
19-22	—	—	—	CRC check digits (see CRC section, below) Contains checksum of byte 4 through byte 18 inclusive

----- DATA RECORDS -----

This is a 40 byte record that is composed of the following information:

BYTES	ASCII	HEX #	DEC #	DESCRIPTION
1-2	SYN	16	22	Synchronization characters
3	SOH	1	1	Start of header character
4	D	44	68	The ASCII character "D" for data record
5	STX	2	2	Start of text character
6-8	—	—	—	Customer group number
9	—	—	—	Record type indicator
10-13	—	—	—	Unit ID number
14-17	—	—	—	Month and day of call (MMDD)
18-21	—	—	—	Time of the call (HHMM in 24 hour time)
22-23	—	—	—	Length of call in minutes
24-35	—	—	—	Number dialed, right justified
36	ITB	1F	31	Unit separator
37-40	—	—	—	CRC check digits (see CRC section, below) Contains checksum of byte 4 through byte 36 inclusive

----- ENDING RECORD -----

This is a 14 byte record that is composed of the following information:

BYTES	ASCII	HEX #	DEC #	DESCRIPTION
1-2	SYN	16	22	Synchronization characters
3	SOH	1	1	Start of header character
4	N	4E	78	The ASCII character "N" for ending record
5	STX	2	2	Start of text character
6-9	—	—	—	Number of records transmitted
10	EXT	3	3	End of text character
11-14	—	—	—	CRC check digits (see CRC section, below) Contains checksum of byte 4 through byte 10 inclusive

CRC CALCULATIONS

Refer to the CRC routine used, described by Yoseph Linde in "Fast Algorithms for Calculating Cyclic Redundancy Checks", Motorola Correlations, VOL 2, Number 1, Fall 1979.

CLEARING RECORDS

After all of the data has been sent to the receiving unit, CLNG/SLNG asks if records are to be cleared. It is assumed that the receiving computer calculates the CRC for each record and also check the number of records received as shown in the ending record. If any of this information is in error, an N(cr) should be entered and the data downloaded again. If everything appears to be in order, a Y(cr) can be entered and the records can be purged from the CIT.

SAMPLE SESSION

Note: The output is broken into lines in the following example for clarity only. As the data is received at the recording device, no carriage returns or line feeds are seen.

```
GRD> BILL(cr)
BILL> CLNG(cr)

H09270927151ALAF A
D000F00150927110801L 229397NFII
D000F00150927111001L 229397K@L0
D000F00150927111101 5762477KA0B
D000S00010927111201L 902048KJIF
D700 E0030927111601L 757347N@MK
D700 E0030927111701 5762477DMEC
D700T0E010927111801L 803585M0EC
N0007KFML
CLEAR LONG DISTANCE RECORDS (Y/N)? Y(cr)
```

4.2.13 Call Logging Function

The system manager can choose to turn on CALL LOGGING which results in a LONG DISTANCE call record being generated for every call, whether land-to-mobile or mobile-to-land. This logging would be in addition to the normal airtime and TELCO billing records that take place. The calls can be listed and cleared from memory with the BILL SLNG command. Presently, there is room in memory for a total of 1450 call records such as logging records, long distance call records or (0+) credit card call records.

To turn on LOGGING:

```
GRD> BILL(cr)
BILL> LOGY(cr)
```

To turn off logging:

```
GRD> BILL(cr)
BILL> LOGN(cr)
```

Only true long distance or (0+) calls will be denied if the records become full. In this case, an error message is sent to the system manager who must perform the CLNG or SLNG command and clear the memory.

4.2.14 Special Call Processing - PBX Command

If the interconnect system is used on a private system, such as a single company or possibly a public safety system, the system manager may elect to turn on "PBX PROCESSING". This is normally used where the telephone system that the CIT is connect to is a private PBX, where internal 4-digit numbers are normally dialed, or a public phone system where the dialing is standard, as in 7-digit local numbers and 10-digit toll numbers, but the TELCO billing is not required (such as in a public safety system).

When PBX processing is active, turned on by the system manager in the BILL command, authorization does not process the phone number dialed for mobile-to-land calls other than 0+ or 1+ calls. In other words, the mobile unit is allowed to dial any phone number except those beginning with a 0 or a 1 unless 1+ or 0+ is enabled for that unit. The number dialed can be monitored in either of two ways, however. One way is to turn on logging, which generates a call record for every call, mobile-to-land or land-to-mobile. The second way is to use the MEXC command in BILL to set the exchange rate for exchange 200 to toll (15,15). Exchange 200 is used for each call when PBX processing is turned on. If logging is off, and the rate for exchange 200 is set to (15,15), only mobile-to-land calls generate call records, which can be read and cleared with the CLNG/SLNG command in BILL. Mobile-to-land calls are not shut off if the records become full. (The memory has room for 1450 call records.)

If the exchange rate for exchange 200 is set to free (00,00), and logging is turned on, each call (mobile-to-land or land-to-mobile) is logged into the call records and the "Local Call" count in the BILL STEL summary is increased by 1 for each mobile-to-land call.

If the exchange rate for exchange 200 is set to metered charge rate, such as (01,00), each mobile-to-land call is billed 1 unit. If logging is on, then a call record is generated too.

When PBX processing is used, the audio from the subscriber unit is immediately "cut-through" to the phone company allowing the mobile to pass DTMF digits directly on to the PBX. This allows the user to hear the 2nd dial tone and to know when to continue dialing, or hear a "busy" if all circuits are busy. If the lines are marked as being PULSE lines, the system converts the DTMF tones from the subscriber unit into pulse tones for the pulse only phone line. If the "#" is dialed, then the system stops converting DTMF into pulse codes and passes the DTMF on to the phone lines. This accommodates those situations where some answering device (paging terminal or other device) can use only DTMF codes, even though only pulse codes could be used to get to the device. For example, if the line is coded PULSE only, if the number 9 555 1212 # 4321 is dialed from the subscriber unit, the 9 555 1212 would be converted to pulse, but the 4321 would be passed in DTMF mode.

Turning on PBX processing is done as follows:

```
GRD> BILL(cr)
BILL> PBXY(cr)
```

Turning off PBX processing is done as follows:

```
GRD> BILL(cr)
BILL> PBXN(cr)
```

4.2.15 RSET Command

The RSET command allows the operator to execute the INIT command a second time thereby eliminating all previously entered airtime and TELCO charge parameter information. This command should only be used to clear a condition in which the majority of airtime and TELCO charge parameter information is invalid. The parameters are cleared upon execution of the INIT command after the RSET command. An example of the command function follows:

```
GRD> BILL(cr)
BILL> RSET(cr)
USE 'INIT' INPUT TO CALCULATE BILLING CHARGES (Y/N)? N(cr)
BILL> INIT(cr)
....
....
....
Etc.
```

The RSET command can also be used after a RESET command to possibly save the airtime and TELCO charge parameters including the local area code exchange rate entries.

Example 25 shows how to use the RSET command in this way.

Example 25.

```
GRD> AUTH(cr)
AUTH> RESET(cr)
CLEAR ALL AUTHORIZATION & BILLING DATA, ARE YOU SURE (Y/N)? Y(cr)
AUTHORIZATION & BILLING RESET
AUTH> QUIT(cr)
INACTIVE USER LIST
GRD> BILL(cr)
BILL> RSET(cr)
USE 'INIT' INPUT TO CALCULATE BILLING CHARGE (Y/N)? Y(cr)
BILL>
```

4.2.16 GRDD Command

The GRDD routine adds the ability to save and load certain parts of system memory to avoid having to re-type-in by hand certain tables and parameters in the event system memory is lost or becomes corrupted. The system uses Motorola S records to save memory on tape or restore memory from tape. Refer to Figures 1 and 2 for connection details.

The GRDD command causes the system manager to enter the GUARDIAN processor. This processor is used to download MCB memory to a tape or upload data from a tape to MCB memory. Once you have entered the processor, all interconnect calls will be disabled, any calls in process will be terminated. The prompt "GRDD>" will appear. To this prompt, a variety of commands can be given. Following is a table listing these commands.

Command	Section	Description
L	4.2.16.2	Load tape contents into dynamic RAM
IL	4.2.16.1	Enable page 0 of dynamic RAM
IH	4.2.16.1	Enable page 1 of dynamic RAM
P x-y	4.2.16.3	'Punch' memory contents specified onto tape will move address from x to y inclusively
Q	4.2.16.4	Leave GUARDIAN and return to BILL< prompt
RW	4.2.16.5	Rewind the tape in the tape recorder
TD	4.2.16.6	Set the port to AUX PORT J4
TS	4.2.16.7	Set the port to the system manager port
V	4.2.16.8	Verify contents of a tape
CONTROL-X	4.2.16.10	Terminate upload/download to/from tape

4.2.16.1 ENABLE MEMORY PAGE Command

This command selects the page of memory that is to be saved to tape or restored from tape. The character that follows the command should be "L" for page 0 or "H" for page 1. Example:

```
GRDD> IL(cr)
GRDD>
```

4.2.16.2 LOAD TAPE-TO-MEMORY Command

This command moves data saved on tape back into the MCB. Before issuing the LOAD command, there are several items to consider.

- 1) If the tape unit is "in series" with the system manager terminal, enter the TS command so the proper data path is established. The normal mode is TD. Refer to Figures 1 and 2 for details in determining which type connection you have.
- 2) Enter the "RW" command to rewind the tape to the beginning. Wait for the rewind lamp to go out. (If the unit is located remotely, wait one full minute.)

- 3) Enter the "I" command to select the proper page of dynamic RAM. This is normally the "IL" command for the first page of memory and "IH" for the second page of memory.
- 4) Enter the "L" command to load page 0 of RAM.
- 5) Repeat steps 3 and 4 for each additional page of memory that is to be restored.
- 6) Enter the "L" command to load static RAM.
- 7) Enter the "Q" command to exit from GRDD> and restore call processing functions (all interconnect call processing is suspended during the time you are in GRDD).
- 8) Check the time and date and reset them if necessary.

At a rate of 9600 baud, it takes about 3 minutes to load each page of RAM. At slower speeds, longer times are required (for example, it takes 96 minutes at 300 baud).

```
GRDD> TS(cr)
GRDD> RW(cr)
GRDD> IL(cr)
GRDD> L(cr)
GRDD> IH(cr)
GRDD> L(cr)
GRDD> Q(cr)
```

4.2.16.3 PUNCH MEMORY-TO-TAPE Command

This command moves data from the MCB into the tape unit. Before issuing the PUNCH command, there are several items to consider.

- 1) If the tape unit is "in series" with the terminal, enter the TS command so the proper data path is established. The normal mode is TD. Refer to Figures 1 and 2 for details in determining which type connection you have.
- 2) Enter the "RW" command to rewind the tape to the beginning. Wait for the rewind lamp to go out. (If the unit is located remotely, wait one full minute.)
- 3) Enter the "I" command to select the proper page of dynamic RAM. This is normally the "IL" command for the first page of memory and "IH" for the second page of memory.
- 4) Enter the "P 0-7FFF" command to record page 0 of RAM.
- 5) Repeat steps 3 and 4 for each additional page of memory that is to be recorded.
- 6) Enter the "P 9000-9FFF" command to record static RAM.
- 7) Enter the "Q" command to exit from GRDD> and restore call processing functions (all call processing is suspended during the time you are in GRDD). You can also verify that the tape record is good. If this is desired, follow the commands listed under the VERIFY command.

At a rate of 9600 baud, it takes about 3 minutes to record each page of RAM. At slower speeds, longer times are required (for example, it takes 96 minutes at 300 baud).

```
GRDD> TS(cr)
GRDD> RW(cr)
GRDD> IL0(cr)
GRDD> P 0-7FFF(cr)
GRDD> IH1(cr)
GRDD> P 0-7FFF(cr)
GRDD> P 9000-9FFF(cr)
GRDD> Q(cr)
```

4.2.16.4 QUIT Command

The QUIT command exits from GRDD. When this command is given, the system exits and normal mode is restored for all call processing.

```
GRDD> Q(cr)  
BILL>
```

4.2.16.5 REWIND TAPE Command

This command causes GRDD to send a CONTROL-Z character to the tape recorder. With most recorders, this command causes the unit to rewind the tape to the beginning.

```
GRDD> RW(cr)  
GRDD>
```

4.2.16.6 SET TAPE PORT to SYSTEM MANAGER PORT Command

When GRDD is first entered, tape in/output goes through the AUX PORT J4 as shown in Figure 1. If the recorder is connected to the system manager port, this command must be issued to cause the in/output to go through the system manager port, as shown in Figure 2.

```
GRDD> TS(cr)  
GRDD>
```

4.2.16.7 SET TAPE PORT DEFAULT Command

This command sets the in/output to the tape recorder through the AUX PORT J4. This is the normal mode. This command is needed only if the mode was changed with the "TS" command earlier in the session.

```
GRDD> TD(cr)  
GRDD>
```

4.2.16.8 VERIFY Command

This command verifies recorded data from the MCB is good. Before issuing the VERIFY command, there are several items to consider.

- 1) If the tape unit is "in series" with the terminal, enter the TS command so the proper data path is established. The normal mode is TD. Refer to Figures 1 and 2 for details in determining which type connection you have.
- 2) Enter the "RW" command to rewind the tape to the beginning. Wait for the rewind lamp to go out. (If the unit is located remotely, wait one full minute.)
- 3) Enter the "I" command to select the proper page of dynamic RAM. This is normally the "IL" command for the first page of memory and "IH" for the second page of memory.
- 4) Enter the "V" command to verify page 0 of RAM.
- 5) Repeat steps 3 and 4 for each additional page of memory that is to be verified.
- 6) Enter the "V" command to verify static RAM.
- 7) Enter the "Q" command to exit from GRDD> and restore call processing functions (all call processing is suspended during the time you are in GRDD).

At a rate of 9600 baud, it takes about 3 minutes to verify each page of RAM. At slower speeds, longer times are required (for example, it takes 96 minutes at 300 baud).

```
GRDD> TS(cr)
GRDD> RW(cr)
GRDD> IL(cr)
GRDD> V(cr)
GRDD> IH(cr)
GRDD> V(cr)
GRDD> V(cr)
GRDD> Q(cr)
```

4.2.16.9 CONTROL-X Command

The CONTROL-X command aborts the current process (LOAD, PUNCH or VERIFY). This is done by holding the CONTROL key down and typing an "X" on the keyboard. Note that no (cr) is required after the CONTROL-X.

```
GRDD> CONTROL-X
GRDD>
```

4.2.17 QUIT Command

The QUIT command exits from BILL. Control is returned to the GRD> prompt.

4.3 TELL COMMAND

The TELL command family permits the system manager to enable, disable or check the current status of a particular telephone repeater interface (TRIB) or a particular phone line interface (PLIB). Other TELL commands allow the specification of pulse or DTMF dialing for each phone line interface, assign the phone company answer threshold time and allow the specification of the physical connection of a particular telephone repeater interface to a particular central channel number. A listing of the TELL command follows:

Command	Description
Enable	Enable a particular TRIB or PLIB circuit
Disable	Disable a particular TRIB or PLIB circuit
Status	Status of a particular TRIB or PLIB circuit
Phone	Dialing specification of a phone line (DTMF or pulse) and answer threshold time (0-60 seconds)
Repeater	TRIB to central controller connection specification
Quit	Exit to GUARDIAN prompt GRD<

An example of the TELL command function follows:


```

GRD> TELL(cr)
TELL> ER 1(cr)
REPEATER INTERFACE #01 ENABLED
TELL> DR 1(cr)
REPEATER INTERFACE #01 DISABLED
TELL> EP 1(cr)
PHONE INTERFACE #01 ENABLED
TELL> DP 1(cr)
PHONE INTERFACE #01 DISABLED
TELL> SR 2(cr)
STATUS OF REPEATER INTERFACE #02
ENABLED
NOT ASSIGNED
NOT MALFUNCTIONED
MUTED

```

```
TELL> SR ALL(cr)
```

```
CHANNEL-# INTERFACE ENABLED MALFUNCTIONED ASSIGNED MUTED
```

01	01	NO	NO	NO	YES
02	02	NO	NO	NO	YES
03	03	NO	NO	NO	YES
04	04	YES	NO	NO	YES
05	05	YES	NO	NO	YES
06	06	NO	NO	NO	YES
07	07	NO	NO	NO	YES
08	08	NO	NO	NO	YES
09	09	NO	NO	NO	YES
10	10	NO	NO	NO	YES
11	11	NO	NO	NO	YES
12	12	NO	NO	NO	YES
13	13	NO	NO	NO	YES
14	14	NO	NO	NO	YES
15	15	NO	NO	NO	YES
16	16	NO	NO	NO	YES
17	17	NO	NO	NO	YES
18	18	NO	NO	NO	YES
19	19	NO	NO	NO	YES
20	20	NO	NO	NO	YES
21	21	NO	NO	NO	YES

TELL> **S P 2(cr)**
 STATUS OF PHONE INTERFACE #02
 IN SYNC
 ENABLED
 NOT MALFUNCTIONED
 NOT ASSIGNED

TELL> **S P ALL(cr)**

INTERFACE	IN-SYNC	ENABLED	MALFUNCTIONED	ASSIGNED	TYPE	THRESHOLD
01	YES	YES	NO	NO	PULSE	00
02	YES	NO	NO	NO	PULSE	00
03	YES	NO	NO	NO	PULSE	00
04	YES	NO	NO	NO	PULSE	00
05	YES	NO	NO	NO	PULSE	00
06	YES	YES	NO	NO	PULSE	00
07	NO	NO	YES	NO	PULSE	00
08	NO	NO	YES	NO	PULSE	00
09	NO	NO	YES	NO	PULSE	00
10	NO	NO	YES	NO	PULSE	00
11	NO	NO	YES	NO	PULSE	00
12	NO	NO	YES	NO	PULSE	00
13	NO	NO	YES	NO	PULSE	00
14	NO	NO	YES	NO	PULSE	00
15	NO	NO	YES	NO	PULSE	00
16	NO	NO	YES	NO	PULSE	00
17	NO	NO	YES	NO	PULSE	00
18	NO	NO	YES	NO	PULSE	00
19	NO	NO	YES	NO	PULSE	00
20	NO	NO	YES	NO	PULSE	00
21	NO	NO	YES	NO	PULSE	00
22	NO	NO	YES	NO	PULSE	00
23	NO	NO	YES	NO	PULSE	00
24	NO	NO	YES	NO	PULSE	00
25	NO	NO	YES	NO	PULSE	00
26	NO	NO	YES	NO	PULSE	00
27	NO	NO	YES	NO	PULSE	00
28	NO	NO	YES	NO	PULSE	00
29	NO	NO	YES	NO	PULSE	00
30	NO	NO	YES	NO	PULSE	00

TELL> **2(cr)**
 PHONE#01 PULSE DIALING: **0(cr)**
 ANSWER THRESHOLD 10: **15(cr)**
 PHONE#02 PULSE DIALING: **0(cr)**
 ANSWER THRESHOLD 5: **15(cr)**
 PHONE#03 PULSE DIALING: **(cr)**
 ANSWER THRESHOLD 15: **0(cr)**

TELL> **2(cr)**
 PHONE#01 DTMF DIALING: **(cr)**
 ANSWER THRESHOLD 15: **(cr)**
 PHONE#02 DTMF DIALING: **(cr)**
 ANSWER THRESHOLD 15: **(cr)**
 PHONE#03 PULSE DIALING: **(cr)**
 ANSWER THRESHOLD 15: **0(cr)**

TELL> **3(cr)**
 CENTRAL RF CHANNEL #01 REPEATER INTERFACE #01: **X(cr)**
 CENTRAL RF CHANNEL #02 REPEATER INTERFACE #02: **X(cr)**
 CENTRAL RF CHANNEL #03 REPEATER INTERFACE #03: **01(cr)**
 CENTRAL RF CHANNEL #04 REPEATER INTERFACE #04: **02(cr)**
 CENTRAL RF CHANNEL #05 REPEATER INTERFACE #05: **03(cr)**
 CENTRAL RF CHANNEL #06 REPEATER INTERFACE #06: **0(cr)**

TELL> **3(cr)**
 CENTRAL RF CHANNEL #01 REPEATER INTERFACE # X: **(cr)**
 CENTRAL RF CHANNEL #02 REPEATER INTERFACE # X: **(cr)**
 CENTRAL RF CHANNEL #03 REPEATER INTERFACE #01: **(cr)**
 CENTRAL RF CHANNEL #04 REPEATER INTERFACE #02: **(cr)**
 CENTRAL RF CHANNEL #05 REPEATER INTERFACE #03: **(cr)**
 CENTRAL RF CHANNEL #06 REPEATER INTERFACE #06: **0(cr)**

TELL> **0(cr)**

GRD>

An explanation of the listing follows:

- Central RF channel # - refers to repeater number.
- Repeater interface # - refers to TRIB number.
- Enable, disable, status - The enable, disable and status of a phone interface circuit or a repeater interface circuit is accomplished as shown. A space is required between the command (E, D or S), the interface designator (P or R) and the interface circuit number. The phone interface status of "in sync" or "out of sync" refers to the serial data communication link between the PLIB and the master control processor board.

NOTE

When an enable or disable is attempted, the terminal waits to return to the prompt until the command is executed and the result printed. If the operator does not want to wait for the result of the command to be printed, CONTROL-X can be entered to return to the prompt.

- Dialing specification - Outbound dialing to the TELCO office can be specified for each line as either DTMF or pulse compatible. The default mode is pulse dialing. Listing and editing of this data is shown for the P command.
- Answer threshold - The Answer threshold is a period of time, from 0 to 60 seconds, that the TELCO duration of the call must be beyond before the call is TELCO billed by the CIT software. For example, if the threshold is set to 25 seconds and the time from the last digit of the phone number being entered and the end of the call is 15 seconds, then the call is assumed to be busy or unanswered and no TELCO charges are added to the user's record. If the time was 50 seconds instead of 15, TELCO charges for the 50 seconds are assessed to the subscriber unit account (minimum billing period amount is at least 1 minute). The system manager is free to set this threshold to a number that makes sense depending on how fast the TELCO lines work. Normally, 30 seconds is used. Properly using a non-zero threshold avoids overcharging for busy or unanswered calls.
- Repeater interface connection - The CIT sets the default connection between a telephone repeater interface circuit and a central rf channel to correspond to the TRIB placement in the CIT. For example, the default connection specification for the three telephone repeater interfaces located on a TRIB in slot 1 is central RF channels 1, 2 and 3. For a TRIB located in slot 2, the connection specification is central RF channels 4, 5 and 6, etc. The process of editing the connection specifications is as shown in the listing of the R command. The letter "X" should be entered for REPEATER INTERFACE # when there is no TRIB on that channel.

5. AUTOMATIC SYSTEM ALARM CAPABILITY

5.1 INTRODUCTION

The central controller is designed to alert the system manager when certain central controller or repeater malfunctions occur. This is done in two ways. One is the automatic generation of diagnostic messages on the system manager's terminal (with the system manager's terminal connected to the central controller and in the active mode). The other way is activation of an external alarm device by means of relay contacts triggered by commands from the central controller. No external alarm device is supplied with the central controller, however relay contacts are provided. Refer to paragraph 5.3 for external alarm connection details.

5.2 SYSTEM MANAGER'S TERMINAL ALARM MESSAGES

5.2.1 General

The system manager's terminal automatically prints out alarm messages if, and only if, the following conditions are met:

All Models

- The central controller is active or idle.
- A central controller-detectable malfunction occurs in either the central controller or a base-repeater station.

- Models T5188 or T5188 with option D401*

- Model T5184*

- 11-15-88

\$A0 - \$B7	Telephone Repeater Interface
\$B8	Master Control Board
\$B9 - \$D7	Phone Line Interface
\$E0	Central Site Controller
\$E1 - \$EA	CACB Interfaces
\$F0	Undefined

Device Name specifies the device, by name, referred to in the message:

CSC	Central Site Controller
RCSC	Remote Central Site Controller
CACB XX	Asynchronous Communications Board on CSC

RSC	Receiver Site Controller
ReSC	Remote Site Controller
IRB	Inbound Recovery Board
RIB XX	Receiver Interface Board
RTIB XX	Remote Transmitter Interface Board
CRB	Clock Recovery Board

TSC	Transmitter Site Controller
TIB XX	Transmitter Interface Board

MCB	Master Control Board
PLIB XX	Phone Line Interface Board
TRIB XX	Telephone Repeater Interface Board

TCI	Trunked Console Interface
TACB XX	Asynchronous Communications Board on TCI
BIM XX	Base Interface Module

DCB	Data Concentrator Board
DACB XX	Asynchronous Communications Board on DCB

Site Reporting specifies the site reporting the message:

00	Main Site
01 - 99	Remote sites in ACB interface order

Central Identifier specifies, in the first character, which Central is reporting this message, 'M' for the main central, or 'B' for the backup central. The second character specifies whether that central is 'A' for active, or 'I' for idle.

Examples:

```
*DIAG*      00:00:00 01/01/86 MA 00 CSC      E0 0F 08 21

CENTRAL/STATUS : MAIN/ACTIVE
SITE           : PRIME
NAME           : CSC
DEVICE         : $E0
CONDITION      : ERROR MESSAGE
TASK           : $08
MESSAGE        : ENTERED FAILSOFT : NO RSC PORT

*DIAG*      00:00:00 01/01/86 BI 00 RIB 11    4A 0C 00 25

CENTRAL/STATUS : BACKUP/IDLE
SITE           : PRIME
NAME           : RIB 11
DEVICE         : $4A
CONDITION      : MALFUNCTION DEVICE
TASK           : $00
MESSAGE        : DISCONNECT TONE FAILURE ON RIB CHANNEL 11
```

```

*DIAG*      00:00:00 01/01/86 BA 01 RTIB 01      76 0A 00 00

CENTRAL/STATUS      : BACKUP/ACTIVE
SITE                : REMOTE SITE NUMBER 1
NAME                : RTIB 01
DEVICE              : $76
CONDITION           : ENABLED DEVICE
TASK                : $00
MESSAGE             : NONE

*DIAG*      00:00:00 01/01/86 MI 00 CSC      E0 0F 00 02 16 43 05

CENTRAL/STATUS      : MAIN/IDLE
SITE                : PRIME
NAME                : CSC
DEVICE              : $E0
CONDITION           : ERROR MESSAGE
TASK                : $00
MESSAGE             : UNKNOWN ISW ID = 1643 / TYPE = 05

*DIAG*      00:00:00 01/01/86 MA 03 TIB 05      64 0C 00 23

CENTRAL/STATUS      : MAIN/ACTIVE
SITE                : PRIME
NAME                : TIB 05
DEVICE              : $64
CONDITION           : MALFUNCTION DEVICE
TASK                : $00
MESSAGE             : No TSTAT during a call

```

5.2.2.1 DIAGNOSTIC MESSAGES

Following is a list of diagnostic error messages:

```

#
*****
*
*   BIM ERROR MESSAGES
*   DEVICE: $00 - $14
*
*   TASK ID NUMBER: 00
*****
#
*   00 - BIM status change (look at condition for current status).
#

#
*****
*
*   TACB ERROR MESSAGES
*   DEVICE: $15 - $1E
*
*   TASK ID NUMBER: 01
*****
#
*   10 - TIMI link status change (look at condition for current status).
*   2F - TIMI front panel Switch change (look at condition for current status).
#

```

*
* TCI ERROR MESSAGES
* DEVICE: \$21
*

* TASK ID NUMBER: 00

*
* 01 - TCI RESTART - LACK OF TICKLE OR MANUAL RESET
* 02 - TCI RESTART - POWER FAIL
* 03 - TCI RESTART - DRAM CHECKSUM ERROR
* 04 - TCI RESTART - DIAGNOSTIC RECEIVED TEST STARTED
* 05 - TCI RESTART - NO SHORT BINS
* 06 - TCI RESTART - NO LONG BINS
* 07 - TCI RESTART - LOST LINK TO CSC.
*
* 10 - DCB link enabled.
* 11 -
* 12 - This link has detected a DCD error.
* 13 - No CTS on this port.
* 14 - This link has detected a framing error.
* 15 - This link has detected a over-run error.
* 16 - This link has detected a parity error.
* 17 -
* 18 -
* 19 - ECHO sync was lost from device.
* 1A - Receive checksum error for this link.
* 1B - receiver buffer overflow for this link.
* 1C - Unknown ACIA error for this link.
* 1D - Sent queue overflow for this link.
*

*
* TCI ERROR MESSAGES
* DEVICE: \$21
*

* TASK ID NUMBER: 01

*
* 08 - Invalid opcode for an EDM command.
* 09 - Invalid device number for an EDM command.
* 0A - TBIM command received from CSC with nothing pending. .
*

*
* TCI ERROR MESSAGES
* DEVICE: \$21
*

* TASK ID NUMBER: 02

*
* 08 - Invalid opcode for an EDM command.
* 09 - Invalid device number for an EDM command.
* 0B - Invalid PARM received from CSC.
*

*

* TCI ERROR MESSAGES
* DEVICE: \$21

*

* TASK ID NUMBER: 03

*

* 0D - 1st word ISW received but no 2nd word.
* 0E - 2nd word ISW received but no 1st word.
* 0F - Bad ID in regroup request.

*

*

* TCI ERROR MESSAGES
* DEVICE: \$21

*

* TASK ID NUMBER: 04

*

* 11 - Bad OSW opcode.

*

*

* TCI ERROR MESSAGES
* DEVICE: \$21

*

* TASK ID NUMBER: 05

*

* 0C - Channel processor received an invalid opcode.

*

*

* RIB ERROR MESSAGES
* DEVICE: \$40 - \$54

*

* TASK ID NUMBER: 00/01

*

* 20 - No Message
* 23 - high speed tone test failure
* 24 - low speed tone test failure
* 25 - disconnect tone failure
* 26 - illegal carrier malfunction
* 2D - RIB(/RTIB) status change due to a site removed from service.
* 2F - Front panel Switch change (look at condition for current status).

*

*

RSC ERROR MESSAGES

DEVICE: \$55

*

TASK ID NUMBER: 00

*

01 - RSC RESTART - LACK OF TICKLE

02 - RSC RESTART - POWER FAIL

03 - RSC RESTART - LOST BATTERY-BACKED RAM

04 - RSC RESTART - TEST STARTED

05 - RSC RESTART - ACIA ERROR

06 - RSC RESTART - BIN ERROR

07 - CSC assigned an already assigned channel (INQWRK)

08 - CSC sent an unknown PARM (INQWRK)

09 - Unknown opcode error (INQWRK)

0A -

0B -

0C - Device number out of range (INQWRK)

0D -

0E -

0F -

10 - RSC-CSC link enabled

11 -

12 - This link has detected a DCD error.

13 - NO CTS on the this port.

14 - This link has detected a framing error.

15 - This link has detected a over run error.

16 - This link has detected a parity error.

17 -

18 -

19 - ECHO sync was lost on the this link.

1A - Receive checksum error for this link.

1B - Receiver buffer overflow for this link.

1C - Unknown ACIA error for this link.

1D - Sent queue overflow for this link.

1E -

1F -

*

*

IRB ERROR MESSAGES

DEVICE: \$56

*

TASK ID NUMBER: 00/01

*

20 - No Message

21 - IRB interrupt failure

22 - IRB double buffer failure

2D - IRB(/CRB) status change due to a site removed from service.

*

*

CRB ERROR MESSAGES

DEVICE: \$57

*

TASK ID NUMBER: 01

*

20 - No Message.

2B - Malfunction due to test failure.

2D - IRB(/CRB) status change due to a site removed from service.

*

*

ReSC ERROR MESSAGES

DEVICE: \$58

*

TASK ID NUMBER: 00

*

01 - ReSC RESTART - LACK OF TICKLE OR MANUAL RESET

02 - ReSC RESTART - POWER FAIL

03 - ReSC RESTART - LOST BATTERY-BACKED RAM

04 - ReSC RESTART - DIAGNOSTIC RECEIVED TEST STARTED

05 - ReSC RESTART - LOST DCB LINK

06 - ReSC RESTART - BIN ERROR

*

*

ReSC ERROR MESSAGES

DEVICE: \$58

*

TASK ID NUMBER: 01

*

07 - Assigned a previously assigned channel.

08 - Illegal parm received.

09 - Unknown command.

0A - Illegal device addr.: STATUS RESPONSE

0B - Illegal device addr.: ENABLE

0C - Illegal device addr.: DISABLE

0D - Illegal device addr.: STATUS REQUEST

0E - Illegal device addr.: CHANNEL COMMAND

0F - Illegal device addr.: MALFUNCTION

30 - Illegal device addr.: DIAGNOSTIC

31 - Illegal device addr.: DATA TRANSFER

32 - Received XMIT CMD for front panel disabled RTIB.

33 - Illegal device addr.: DEASSIGNMENT

34 - Illegal device addr.: ASSIGNMENT

35 - Assigning a channel with RIB or RTIB not enabled.

36 - Deassigning a deassigned RIB.

37 - Illegal device addr. in key, dekey, mute or unmute.

38 - Received key or dekey for disabled RTIB.

3D - All Remotes removed from service.

40 - No message.

41 - ReSC composite status change due to a site removed from service.

42 - ReSC Malfunction: Majority of channels out of service.

43 - ReSC Malfunction: All control channels out of service.

44 - ReSC Malfunction: CRB has lost lock on the control channel.

45 - ReSC Malfunction: DCB to ReSC link has malfunctioned.

47 - ReSC status change due to Idle/Active hardware change.

4F - ReSC disabled at ReSC front panel.

*

*

■ TIB ERROR MESSAGES

■ DEVICE: \$60 - \$74

■

■ TASK ID NUMBER: 00

*

- * 20 - No Message
- * 21 - No TSTAT indication during test.
- * 22 - TSTAT indication when not keyed (red light failure)
- * 23 - No TSTAT during a call.
- * 24 -
- * 25 - Control channel failed test due to lack of TSTAT
- * 26 -
- * 27 -
- * 28 -
- * 29 -
- * 2A -
- * 2B -
- * 2C -
- * 2D -
- * 2E -
- * 2F - Front panel Switch change (look at condition for current status).

*

*

* TSC ERROR MESSAGES

* DEVICE: \$75

*

* TASK ID NUMBER: 00

*

- * 01 - TSC RESTART - LACK OF TICKLE
- * 02 - TSC RESTART - POWER FAIL
- * 03 - TSC RESTART - LOST BATTERY-BACKED RAM
- * 04 - TSC RESTART - TEST STARTED
- * 05 - TSC RESTART - ACIA ERROR
- * 06 - TSC RESTART - BIN ERROR
- * 07 - Repeat OSW for dequeued channel.
- * 08 - High speed data buffer overrun.
- * 09 - Unknown Opcode.
- * 0A - Buffer load not complete.
- * 0B - OSW data buffer overrun.
- * 0C - Channel number out of range.
- * 0D - Channel command for disabled or malfunction channel.
- * 0E - Illegal command for a control channel.
- * 0F - Channel # IN OSW > 20
- * 10 - TSC-CSC link enabled
- * 11 -
- * 12 - This link has detected a DCD error.
- * 13 - NO CTS on the this port.
- * 14 - This link has detected a framing error.
- * 15 - This link has detected a over run error.
- * 16 - This link has detected a parity error.
- * 17 -
- * 18 -
- * 19 - ECHO sync was lost on the this link.
- * 1A - Receive checksum error for this link.
- * 1B - Receiver buffer overflow for this link.
- * 1C - Unknown ACIA error for this link.
- * 1D - Sent queue overflow for this link.
- * 1E -
- * 1F -
- * 30 - Did not get to priority work on this WFI.

*

*

RTIB ERROR MESSAGES

DEVICE: \$76 - \$8A

*

TASK ID NUMBER: 01

*

20 - No Message.

27 - Malfunction due to no TSTAT during test.

28 - Malfunction due to TSTAT present when not

29 - Malfunction due to no TSTAT during call.

2A - Malfunction due to no TSTAT for control channel.

2C - Malfunction due to CRB losing lock on control channel.

2D - RIB(/RTIB) status change due to a site removed from service.

2F - Front panel Switch change (look at condition for current status).

*

*

DCB ERROR MESSAGES

DEVICE: \$90

*

TASK ID NUMBER: 00

*

01 - DCB RESTART - LACK OF TICKLE OR MANUAL RESET

02 - DCB RESTART - POWER FAIL

03 - DCB RESTART - LOST BATTERY-BACKED RAM

04 - DCB RESTART - DIAGNOSTIC RECEIVED TEST STARTED

05 - DCB RESTART - LOST CSC (TCI) LINK

06 - DCB RESTART - BIN ERROR

07 - DCB restart due to invalid request.

*

10 - DCB link enabled.

*

11 -

12 - This link has detected a DCD error.

13 - No CTS on this port.

14 - This link has detected a framing error.

15 - This link has detected a over-run error.

16 - This link has detected a parity error.

17 -

18 -

19 - ECHO sync was lost from device.

1A - Receive checksum error for this link.

1B - receiver buffer overflow for this link.

1C - Unknown ACIA error for this link.

1D - Sent queue overflow for this link.

1E -

*

*

* DCB ERROR MESSAGES

* DEVICE: \$90

*

* TASK ID NUMBER: 01

*

* 08 - Illegal data transfer (parm).

* 09 - Unknown command from prime site.

* 0A - Unknown command from remote site.

* 0B - Illegal source site for tone status update.

* 0C -

* 0D -

* 0E -

* 0F - Illegal lock command.

* 32 - Remote device status from CSC.

* 33 - Invalid site id given for conversion.

* 36 - Illegal control channel update.

* 3D - ReSC status mismatch in status response.

* 3E - IRB status mismatch in status response.

* 3F - RIB status mismatch in status response.

* 40 - Remote update from master CSC while locked enabled.

* 41 - Remote update from master CSC while locked disabled.

* 42 - Remote update from master CSC while locked malfunctioned.

* 43 - Malfunction lost after confirmation.

* 44 - Address of site malfunction lost.

* 45 - Malfunction lost before confirmation.

* 46 - Remote MALFUNCTIONED due to CONTROL CHANNEL failure.

* 47 - Received invalid unrequested EDM command.

* 48 -

* 49 -

* 4A - Some status update with device locked enabled.

* 4B - Some status update with device locked disabled.

* 4C - Some status update with device locked malfunctioned.

*

*

* DCB ERROR MESSAGES

* DEVICE: \$90

*

* TASK ID NUMBER: 02

*

* 07 - Invalid site id to convert.

*

* 0C - Invalid device number to convert.

*

* 38 - Weight conversion to command error.

* 39 - Command conversion to weight error.

*

*

* DCB ERROR MESSAGES

* DEVICE: \$90

*

* TASK ID NUMBER: 03

*

* 0A -

* 0B - Illegal source source site for tone status update.

* 0C -

* 0D - Inappropriate device number for tone update.

*

* 34 - Tone update with ReSC not enabled.

* 35 - Tone update with RIB/TIB not enabled.

* 36 -

* 37 - Tone table conversion error.

*

*

DCB ERROR MESSAGES
DEVICE: \$90

*

TASK ID NUMBER: 04

*

0E - Bad bin from prime interface.

▯

3A - DCB detected prime interface failure.

▯

*

DCB ERROR MESSAGES
DEVICE: \$90

*

TASK ID NUMBER: 05

▯

30 - Remote link up.

*

31 - Remote link failure due to lack of received data.

▯

*

DCB ERROR MESSAGES
DEVICE: \$90

*

TASK ID NUMBER: 07

▯

48 - Invalid 3X command length requested.

*

*

DACB ERROR MESSAGES
DEVICE: \$91 -9A

▯

TASK ID NUMBER: 06

▯

2F - Status of link after front panel change.

*

*

* I.C.U. ERROR MESSAGES

* DEVICE: \$B8

*

* TASK ID NUMBER: 00

*

- * 01 - ICU RESTART - LACK OF TICKLE
- * 02 - ICU RESTART - POWER FAILURE RESET
- * 03 - ICU RESTART - BATTERY-BACKED RAM LOST
- * 04 - ICU RESTART - TEST REQUEST RESET
- * 05 - ICU RESTART - ACIA ERROR
- * 06 - ICU RESTART - BIN ERROR
- * 07 - Dialtone detect failure
- * 08 - Audio synthesizer malfunction
- * 09 - DTMF decoder malfunction
- * 0A - Minor matrix malfunction
- * 0B - Cut-through relay malfunction
- * 0C - Multiple PLIB malfunction
- * 0D - Matrix vertical failure
- * 10 - ICU-CSC link enabled
- * 12 - This link has detected a DCD error.
- * 13 - NO CTS on the this port.
- * 14 - This link has detected a framing error.
- * 15 - This link has detected a over run error.
- * 16 - This link has detected a parity error.
- * 19 - ECHO sync was lost on the this link.
- * 1A - Receive checksum error for this link.
- * 1B - Receiver buffer overflow for this link.
- * 1C - Unknown ACIA error for this link.
- * 1D - Sent queue overflow for this link.
- * 21 - GLARE collision on land to mobile call
- * 22 - STOPPED RINGING status from off-hook and assigned PLIB
- * 23 - Two consecutive ICU reads from a PLIB did not match
- * 24 - An alert tone command was received for a call on a broken PLIB
- * 25 - Failure command for unassigned PLIB
- * 26 - Invalid PLIB command from CSC
- * 27 - Off-hook command on unassigned PLIB
- * 28 - Invalid request from PLIB
- * 29 - Onhook command from unassigned PLIB
- * 2A - Digits from unassigned PLIB
- * 2B - Long distance call log 75% full, time to list and delete
- * 2C - Long distance call log full. LONG DISTANCE CALLING DISABLED
- * 2D - New assignment to a TRIB that is already assigned
- * 2E - Alert tone command from unassigned TRIB
- * 2F - Status of TRIB after front panel change
- * 31 - Aborting a call assigned to an unassigned TRIB
- * 33 - Sixteen bytes of DRAM have been corrupted
- * 34 - A bin error in DRAM has ocured
- * 35 - Long distance call log error. Records cleared.
- * 36 - Unknown MCB command from CSC
- * 37 - Invalid opcode in command from CSC
- * 38 - Invalid byte count in MCB task command
- * 39 - Unknown OSW command from CSC
- * 3A - Alert tone command for non-voice phase call
- * 3B - ICU decrement command abort
- * 3C - The CSC sent a call grant for an ID already on a call
- * 3D - RING OSW recieved for a call that is in the terminate phase
- * 3E - Could not find the call ID for RING OSW
- * 3F - RING OSW for a non-land-to-mobile call
- * 40 -
- * 41 - A land to mobile call skipped WAIT phase before RING phase
- * 42 - Additional diagnostic cmd from CSC, but test already completed
- *

*

* TRIB ERROR MESSAGES
* DEVICE: \$A0 - \$B7

*

* TASK ID NUMBER: 00

█

* 2F - TRIB front panel Switch change (look at condition for current status).

█

*

* CSC ERROR MESSAGES
* DEVICE: \$E0

*

* TASK ID NUMBER: 00

*

* 01 - CSC RESTART - ANY KIND
* 02 - CSC RESTART - POWER FAIL
* 03 - CSC RESTART - LOST BATTERY-BACKED RAM
* 04 - CSC RESTART - TEST STARTED
* 05 - CSC RESTART - NO LONG BINS
* 06 - CSC RESTART - NO SHORT BINS
* 07 - CSC RESTART - SMT RESET
*

*

* CSC ERROR MESSAGES
* DEVICE: \$E0

*

* TASK ID NUMBER: 02

*

* 01 - Unknown command
* 02 - Repeat OSW stuck due to channel in improper state.
* 03 - Repeat OSW stuck due to incorrect reverse threads

█

*

* CSC ERROR MESSAGES
* DEVICE: \$E0

*

* TASK ID NUMBER: 04

█

* 11 - No bins on INTFTX work queue.
* 12 - Unknown command to INTFTX.

█

*
* CSC ERROR MESSAGES
*
* DEVICE: \$E0
*

* TASK ID NUMBER: 06

- *
* 01 - Unknown task command (ISW DISPATCH processor)
* 02 - Unknown ISW request
*
* XX XX = ID, CC = CALL TYPE
* 03 - OSW falsely referenced and ISW (OSW expiration processor)
* 04 -
* 05 -
* 06 - ICU reject request for a call that ISW couldn't find XXXX = 16 BIT ID.
* 07 - Reserved a D0 or D3 out of sequence .
* 08 - Assigned a call to a channel and the RIB or TIB was already assigned.
* 09 - Assigned a call to a channel and the D4 timer was already active.
* 0A - Assigned a call to a channel and the D5 timer was already active.
* 0B - Assigned a call to a channel and the D6 timer was already active.
* 0C - Interconnect call counter went out of range CURICU.
* 0D - Interconnect call counter went out of range CURSP.
* 0E - Reserve repeater count went too low.
* 0F - Count of non-emergency calls went negative.
* 10 - Received a dual word ISW for a service not yet available.
*

* XX XX YY YY CC, where:

- *
* XX XX = 16 bit id for 1ST word
* YY YY = 16 bit id for 2ND word
* CC = Call Type
* 11 - DCB tried assigning a call to the control channel
* 12 - DCB tried assigning a call to an assigned channel
* 13 - Unit ID of selected group < > 0 in supergroup
* 14 - Number of reserved emergency channels went out of range
* 15 - 5 channel request issued to a 20 channel channel
* 16 - Checksum test on Normal/Tactical table failed
* 17 - ISW for changing Normal/Tactical state with no TCI.
* 18 - Fleetwide emergency received, -where XX XX = 16 bit id
* 19 - System wide call ID received.
* 39 - Checksum test on Normal/Tactical flag table failed
* 40 - Illegal extended function ISW received (change in tactical state
* when no TCI is present)
* 41 - Received an unknown ISW from the ADCB
* 43 - Type II 16-bit individual ID out of range
* XX XX, where
* XX XX = 16-bit individual ID
* 44 - Type II talkgroup ID out of range
* XX XX YY YY where,
* XX XX = 16-bit individual ID
* YY YY = 16-bit talkgroup ID
* 46 - Type II improperly marked fleetwide talkgroup
* XX XX YY YY ZZ ZZ, where
* XX XX = 16-bit ID
* YY YY = talkgroup ID
* ZZ ZZ = fleet ID
* 47 - Type II invalid call type on passport busy queue
* 48 - Type II SAC database lost and SAC function turned off
* 49 - Type II bad data found in individual to talkgroup affiliation table
* 50 - Type II bad data found in talk group to fleet affiliation database
* 51 - Type II count of regrouped members is not consistent with number
* of regrouping bins queued up
* 52 - Type II bin found on channel table corresponding to 2nd set of
* patch PTT grants even though that call is no longer active
* 53 - Type II fleet error for requesting fleetwide talkgroup
* XX XX YY YY ZZ ZZ where,
* XX XX = 16-bit individual id
* YY YY = talkgroup id
* ZZ ZZ = fleet id
* 54 - Type II fleet error for active fleetwide talkgroup
* XX XX YY YY ZZ ZZ where,
* XX XX = 16-bit individual id
* YY YY = talkgroup id
* ZZ ZZ = fleet id
*

*
* CSC ERROR MESSAGES
* DEVICE: \$E0
*
* TASK ID NUMBER: 06 (Cont'd.)

*
* 55 - Dram problem found in talkgroup-to-supergroup table during call processing
* XX XX where,
* XX XX = start of regrouped talkgroup block
* 56 - Received request with ID type in wrong range
* XX XX YY where,
* XX XX = 16-bit individual ID
* YY = call type
*

*
* CSC ERROR MESSAGES
* DEVICE: \$E0
*
* TASK ID NUMBER: 07

*
* 01 - CHLWRK started with no work
* 02 - Illegal RSC command received
* 03 - Illegal device number in RSC command
* 04 - Command received for inactive RSC
* 05 -
* 06 - Illegal command received
* 07 - Illegal device number in TSC command
* 08 - Command received for inactive TSC
* 09 - Pending command on deassigned channel XX (hex)
* 0A -
* 0B - Illegal intertask command received
* 0C - Illegal channel address in intertask command
* 0D - Intertask command received out of the expected sequence
* 0E - CALL STARTED FOR A CALL TYPE NOT YET SERVICED
* 0F - Abnormal call end
*
* XX CC DD FF TT RR II II
* XX = CHANNEL NUMBER
* CC = CALL TYPE
* DD = D5 TIMER NUMBER
* FF = FLAGS
* TT = TIB STATUS
* RR = RIB STATUS
* II II = 16 BIT ID
* 10 - DCB assigned call to chl marked as assigned at remote
* 11 - Invalid RIB # from DCB
* 12 - Invalid TIB # From DCB
* 13 - Invalid cmd from DCB
* 14 - Cmd from DCB with TSC not active
* 15 - Cmd from DCB with RSC not active
* 16 - DCB not active
*

*
* CSC ERROR MESSAGES
* DEVICE: \$E0
*

* TASK ID NUMBER: 08

*
* 01 - EDMWRK started with no work to do
* 02 - EDMWRK started, but unknown command received
* 03 - Illegal device number in status change command
* 04 - Device number out of range
* 05 - Illegal carrier T.O. set to infinite to avoid failsoft.
* 06 - Tried to end an AMSS call
* 07 - Tried to do a BSI, but a channel availability conflict exists.
* 08 - Illegal device number in BSI command
* 09 -
* 10 - This Central has changed from Idle to Active.
* 11 - This Central has changed from Active to Idle.
* 20 - EXIT FROM FAILSOFT
* 21 - ENTERED FAILSOFT DUE TO: NO RSC LINK
* 22 -
* 23 - ENTERED FAILSOFT DUE TO: NO IRB
* 24 - ENTERED FAILSOFT DUE TO: NO TSC PORT
* 25 -
* 26 - ENTERED FAILSOFT DUE TO: NO RIB FOR CONTROL
* 27 - ENTERED FAILSOFT DUE TO: NO TIB FOR CONTROL
* 28 - ENTERED FAILSOFT DUE TO: NO RIB FOR VOICE CHANNEL
* 29 - ENTERED FAILSOFT DUE TO: NO TIB FOR VOICE CHANNEL
* 2A - ENTERED FAILSOFT DUE TO: TCI REPORTING NO TSC LINK
* 2B - ENTERED FAILSOFT DUE TO: TCI REPORTING NO TIMI LINKS
* 2C - ENTERED FAILSOFT DUE TO: NO BIM FOR CONTROL
* 2D - ENTERED FAILSOFT DUE TO: NO BIM FOR VOICE
* 2E - Entered FAILSOFT due to: No TCI Link.
* 2F - Entered FAILSOFT due to: No DCB Link.
* 30 - Entered FAILSOFT due to: ReSC Malfunction.
* 31 - Entered FAILSOFT due to: ReSC Composite Status Change.
* 32 - Entered FAILSOFT due to: ReSC Majority Channel Failure.
* 33 - Entered FAILSOFT due to: No Control Channels at a Remote.
* 34 - Entered FAILSOFT due to: ReSC CRB Malfunction.
* 35 - Entered FAILSOFT due to: ReSC Link Failures.
* 36 - Entered FAILSOFT due to: All ReSC are Disabled or Malf.
* 37 -
* 38 - Entered FAILSOFT due to: No TCI/RSC Link.
* 39 - Entered FAILSOFT due to: No TCI/DCB Link.
* 3A - Entered FAILSOFT due to: ReSC Link Malfunction.
* 3B - Entered FAILSOFT due to: No RTIB for Control.
* 3C - Entered FAILSOFT due to: No RTIB for Voice.
*

*
* CSC ERROR MESSAGES
* DEVICE: \$E0
*

* TASK ID NUMBER: 09

*
* 01 - Dispatch busy/call length not calculated, abnormal length
*

*
* CSC ERROR MESSAGES
* DEVICE: \$E0
*
* TASK ID NUMBER: 0A

*
* 01 - Priority level not valid, set to default
* 02 - Subscriber not active or enabled
* 03 - Duplicate bins purged from system manager queue.
* 04 - Invalid bin address for bin to be released to available queue.
* 05 - Bad codeplug default password
* 06 - Invalid command sent to US2WRK
* 07 - Unsupported command sent to USEWRK
* 08 - Password table corrupted
* 09 - Invalid logon attempt
* 0A - SIMS priority change checksum error
* 0B - Invalid priority value from SIMS
* 0C - SAC database lost during execution of "SAC" command
*

*
* CSC ERROR MESSAGES
* DEVICE: \$E0
*
* TASK ID NUMBER: 0E

*
* 01 - Time data lost
* 02 - Misc. parameter data lost
* 03 - EDMWRK status data lost
* 04 - LOGGER WEEKDAY parameters lost
* 05 - LOGGER WEEKEND parameters lost
* 06 - LOGGER SUMMARY data lost
* 07 - ISWOSW NEGS list lost
* 08 - A value in parms was too low
* 09 - DRAM parity error corrected
* 0A - DRAM malfunction, (bit pattern)
* 0B - ISR data lost bank 1
* 0C - ISR data lost bank 0
* 0D - Fleet - subfleet data lost
* 0E - SUBSCRIBER DATA CORRECTED
* 0F - SUBSCRIBER DATA LOST
* 10 - User defaults and SUBS status lost
* 11 - Subs password lost, reset to system password
* 12 - Bad DRAM in password area
* 13 -
* 14 - All or some talkgroup to fleet affiliation lost
* 15 - All or some individual to talkgroup affiliations lost
* 16 - Dram malfunction while performing affiliation error detection
* 17 -
* 18 - Too many talkgroups set up in the prefix/sizecode table
* for the amount of DRAM (codeplug error)
* 19 - Weekday dispatch timeout table lost
* 1A - Weedend dispatch timeout table lost
*

5.2.2.2 GLOSSARY FOR DIAGNOSTIC MESSAGES

Code	Description
BB	Battery Backed Static RAM
BIM	Base Interface Module
CACB	Asynchronous Communications Board on CSC
CRB	Clock Recovery Board
CSC	Central Site Controller
DACB	Asynchronous Communications Board on DCB
DCB	Data Concentrator Board
IRB	Inbound Recovery Board
MCB	Master Control Board
MCP	Master Control Program
PLIB	Phone Line Interface Board
RCSC	Remote Central Site Controller
ReSC	Remote Site Controller
RIB	Receiver Interface Board
RSC	Receiver Site Controller
RTIB	Remote Transmitter Interface Board
TACB	Asynchronous Communications Board on TCI
TIB	Transmitter Interface Board
TRIB	Telephone Repeater Interface Board
TSC	Transmitter Site Controller

5.3 RELAY-ACTIVATED EXTERNAL ALARMS

The central controller is provided with two sets of dry relay contacts labeled MAJOR ALARM and MINOR ALARM. Refer to Figures 2 and 6. Both sets of relay contacts are normally closed (energized) indicating that a no-alarm condition exists. When a specific alarm condition occurs, the appropriate relay contacts open.

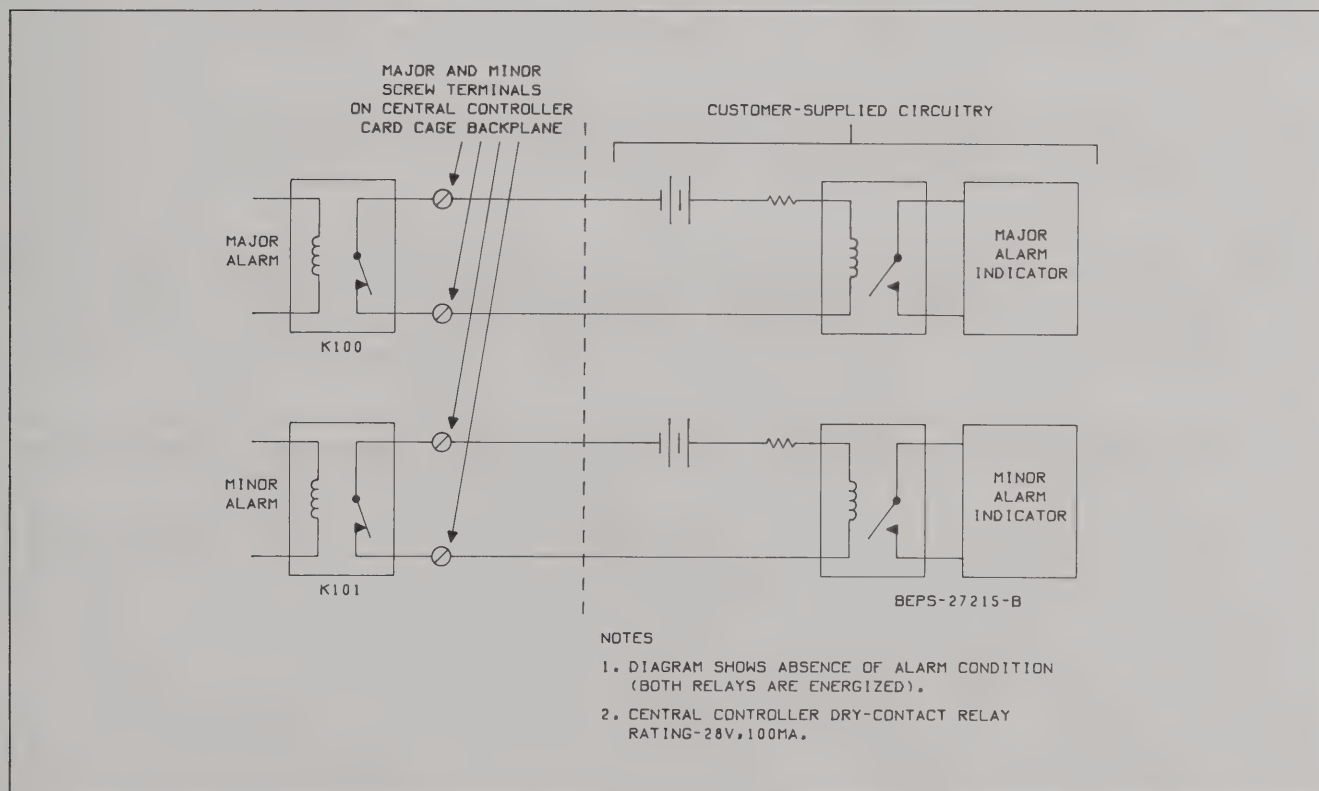


Figure 6. Typical Major and Minor Alarm Circuitry

The MAJOR ALARM relay contacts open when any of the following malfunctions occur:

- AC power to the central controller is lost.
- Failure of the central site controller (CSC), receiver site controller (RSC), transmitter site controller (TSC) board modules or communications with any of these modules.
- Failure of the inbound recovery board (IRB) module.
- Failsoft condition occurs.

The MAJOR ALARM is only cleared via the switch on the front of the site controller board or by resetting the site controller board.

The MINOR ALARM relay contacts open when any of the following faults occur:

- Failure of a voice channel transmitter.
- Failure of a tone detector on any receiver interface board (IRB) module.
- Failure of the Master Control Board module or communications with this module.

The MINOR ALARM is cleared when the cause of the alarm goes away. Alarms are functional only when the site controller boards are in the RUN mode.

The characteristics of the relay contacts are:

- Maximum current ratings: 100 milliamperes.
- Maximum voltage applied: 28 volts DC.

No external alarm devices are supplied by Motorola, but any suitable alarm devices can be used, provided the devices operate within the current and voltage ratings of the relay contacts, as specified.

6. AUTOMATIC SYSTEM IDENTIFICATION

The Motorola *Smartnet II* Trunked Radio System complies with the automatic base station identification (BSI) rule set forth by the Federal Communications Commission (FCC). Consequently the Motorola Trunked Radio System automatically transmits the FCC assigned BSI characters on the lowest available active system channel every 30 minutes. International Morse Code is used for the transmission and BSI is transmitted at a speed of 17 words per minute.

If the lowest assigned system frequency is active with voice traffic at the time of identification transmission, the central controller delays the BSI transmission until traffic activity ceases on the lowest system frequency. Morse Code transmission of the BSI, on the lowest enabled system channel, then takes place.

If the trunked system's channels are covered under multiple licenses, e.g., a shared system, the central controller transmits a BSI for each license on the lowest frequency within the license. Up to 4 licenses can be supported, and, the BSIs and associated channels are programmed into the system code plug.

7. TRUNKED SYSTEM CONFIGURATION

7.1 TYPE I SYSTEMS

7.1.1 Standard Fleet Configuration

The Standard Motorola 800 MHz Trunked Radio System accommodates four types of fleet configurations, as shown in Table 7. The maximum number of each type of fleet that can be handled on one system has been standardized as indicated in the table with smaller fleet sizes predominating.

Table 7. Standard Fleet Configurations for Type I Systems

Fleet Type	Maximum # of Individuals	Subfleets Per Fleet	Maximum # of this type of Fleets in System
A	16	3	225
B	64	7	32
C	128	7	16
D	512	15	2

This fleet partitioning scheme makes provisions for up to 306 fleets which may comprise up to 9216 mobile units and control stations.

7.1.2 Optional Fleet Configurations

7.1.2.1 GENERAL

Optionally, a system may be ordered with special fleet mapping. Table 8 shows the choices for a fleet map. In general, the larger the fleet capacity desired on the system, the fewer the fleets one is able to accommodate.

Each fleet type has been given a letter to represent the type of size code (A-Q). In order to evaluate the selection of the fleet type alternatives available on any given trunked system, a weighted system is used. A maximum total of 8 points can be allocated for a single trunked system. If desired, 8 different fleet types (each one only one point in weighted value) can be chosen for the systems. One of each fleet types A-H would be an example. Otherwise, any combination, or even 8 points, all of one fleet type, can be selected.

7.1.2.2 SYSTEM EXAMPLES

An example of utilizing the new fleet sizes is illustrated as follows:

- A city-wide system is begun with a 5-channel system for the public works department. One major department is set up as two major fleets — water and street maintenance. They each start on a “D”-size fleet, each with 270 units.
- One year after the system has become operational, the central controller is upgraded to include dynamic re-grouping capability and emergency call. Ten new repeaters are installed and both the police and fire departments, with 400 units each, begin to be phased in — each using a “D”-size fleet. A total of 1340 units are operational.
- One of the requirements the city considers important is for all the police and fire units to be able to access an All-Call Channel. One subfleet in an “O”-type fleet has been set up with the ID capacity of 2048. Each police and fire vehicle is equipped with this fleet/subfleet access. Finally, a neighboring community is also now planning to install a trunked system. Another subfleet of the All-Call fleet has been set aside for the mutual-

Table 8. Type I Optional Fleet Configurations

Size Code	Weighted Points	Fleets	Subfleets Per Fleet	Maximum Unit IDs Per Fleet
A*	1	128	3	16
B*	1	16	7	64
C*	1	8	7	128
D*	1	1	15	512
E	1	64	3	32
F	1	32	7	32
G	1	32	3	64
H	1	16	3	128
I	1	8	3	256
J	1	4	7	256
K	1	2	15	256
M	2	1	15	1024
O	4	1	15	2048
Q	8	1	15	4096

* Standard fleet types — (2) each in a standard fleet map.

aid group so that any of the police or fire vehicles of either community, as required, can access that subfleet. The resulting fleet map has been established that now utilizes four "D"-size fleets, and one "O"-size fleet — a total of 8 weighted points.

- The fleet size configuration allows for extra subfleets in the fleets so that dynamic regrouping may be created. However, there are no extra whole fleets that can be created because all fleets are used. If a "I"-, "J"-, or "K"-type size code were used in place of one of the "D"-size fleets, additional fleet capacity would have been available.

One should note that if there is a modification required of the fleet size, for instance, to allow more units beyond the limit of the original fleet size, code plugs need to be modified in all units in the field in order to change fleet types (and allow more capacity).

Also, when a system that has been in operation for a period of time requires a change in the fleet map, if no mobiles have been assigned within a particular size code group, the size code can be exchanged without affecting units already on the system.

7.2 TYPE II SYSTEMS

The Type II protocol uses a signaling word that can contain either the talk group or individual ID information, independently. The Type II protocol between the radios and the central controller specifies which ID information is to be used, and, when it is to be used.

This fleet partitioning scheme makes provisions for up to 2048 talk groups if the system has priority monitor, 4096 talk groups without priority monitor. These talk groups may comprise up to 48,000 mobile units and control stations. The Type II system configuration is shown in Tables 9 and 10.

Up to 2048 fleets with priority monitor, 4096 without, may be used in a system, without any restrictions put upon the number of talk groups per fleet, or, fleets per prefix. If desired, only one fleet may be used, comprised of all available talk groups and individual IDs. As shown in Table 9, a size code of X is used for each prefix in a Type II system.

7.3 MIXED SYSTEMS (TYPE I AND TYPE II)

Mixed systems allow Type I radios to have all basic trunking features and all Type I features when operating with other Type I radios on the system. Mixed systems also allow Type II radios to have all basic trunking features, Type I features, and Type II features with other Type II radios. In addition, mixed systems will allow Type I radios to communicate with Type II radios on the same voice channel. Mixed systems will operate at 800 MHz.

Table 9. Type II System Prefix/Size Code Map

System Prefix	Size Code	Units
0	X	8191/Prefix
1	X	8192/Prefix
2	X	8192/Prefix
3	X	8192/Prefix
4	X	8192/Prefix
5	X	8192/Prefix
6	X	8192/Prefix
7	X	8191/Prefix

Table 10. Type II Unit IDs allowed by prefix

System Prefix	From Hex	Thru Hex	From Dec	Thru Dec
0	0001	1FFF	1	8191
1	2000	3FFF	8192	16383
2	4000	5FFF	16384	24575
3	6000	7FFF	24576	32767
4	8000	9FFF	32768	40959
5	A000	BFFF	40960	49151
6	C000	DFFF	49152	57343
7	E000	FFFF	57344	65534

7.3.1 System Configuration

In order to expand a Type I system beyond the Type I only fleet map, there are three alternatives:

- Alternative 1 - This requires that at least one system prefix be converted to Type II. This yields up to 8192 Type II IDs (depending on the prefix used) and 256 talk group IDs that can be assigned to new Type II radios. This alternative would apply where the existing system has one size code not currently being used, or, with only a few IDs assigned. Those radios that were assigned would require either code plug changes to reassign them to other Type I size codes, or, an upgrade, if possible, to Type II software. This is the preferred method, and is shown in Table 11.
- Alternative 2 - This requires that only a portion of a system prefix be converted to Type II. That is, if one size code prefix was assigned to 8 "C" size fleets, the address space for only one "C" fleet could be converted. This would leave 7 "C" fleets for Type I IDs. The converted fleet map space would provide 1024 Type II IDs and 32 talk group IDs. This would be useful for existing systems that have some fleets not being used. The numbers used in this example are dependent upon the size code.
- Alternative 3 - This allows any part of the total ID space be allocated for Type II IDs, including subfleets within an existing fleet. This would be effective for existing systems with only very large fleets, already filled with IDs. An example would be a system with only two "O" fleets with 15 subfleets each. If one subfleet was removed from each fleet, 4095 Type II unit IDs and 128 talk group IDs would be available. The numbers used in this example are also dependent upon the size code.

Table 12 displays the tradeoff of Type I fleet map IDs to Type II IDs for each Type I size code:

It is recommended that new systems be set up with at least one prefix set aside for Type I talk groups and IDs. This would aid future interoperability to accept roamers from other existing systems. This would also allow for compatibility with some Type I only radios.

Table 11. Mixed System Prefix/Size Code Map With One Prefix Dedicated to Type II

System Prefix	Size Code	Fleets	Subfleets Per Fleet	Maximum Unit Max Unit IDs
0	A	128	3	16/Fleet
1	A	128	3	16/Fleet
2	B	16	7	64/Fleet
3	B	16	7	64/Fleet
4	C	8	7	128/Fleet
5	C	8	7	128/Fleet
6	D	1	15	512/Fleet
7*	X	256	N/A	8191/Prefix

*Type II prefix — allows for up to 256 talk groups and 8191 units

Table 12. Type I/Type II Fleet Map Tradeoff

Gain for each FLEET converted:			Gain for each SUBFLEET converted:	
Size Code	Talk Groups	Units	Talk Groups	Units
A	2	64	0	16
B	16	512	2	64
C	32	1024	4	128
D	256	8192	16	512
E	4	128	1	32
F	8	256	1	32
G	8	256	2	64
H	16	512	4	128
I	32	1024	8	256
J	64	2048	8	256
K	128	4096	8	256
M	512	16384	32	1024
O	1024	32768	64	2048
Q	*	*	128	4095

* This would convert the entire fleet map to Type II only. The maximum of 48,000 unit IDs and 2048 talk group IDs are actually supported. No Type I units could be on the system.



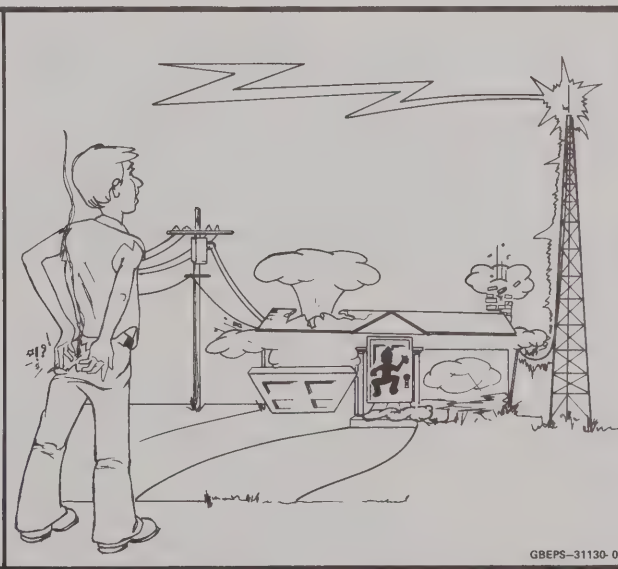
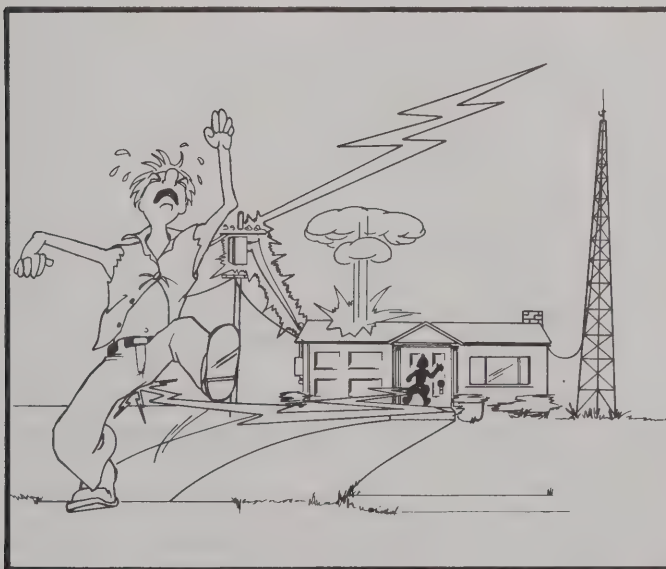
MOTOROLA INC.

Communications
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LIGHTNING PROTECTION RECOMMENDATIONS

The conditions that make a site desirable for two-way radio are the same as those that make a site an excellent target for lightning. Proper lightning protection can completely prevent equipment damage in all but the most severe strikes and even then keep the equipment damage at a minimum. Lightning protection basically consists of preventing the strike from entering the equipment room and then preventing damage to the equipment from induced voltages and currents on power and control lines to the equipment. The following suggestions will help protect valuable radio facilities. Some products already incorporate certain suppressors as standard equipment. In these cases, additional protection is not normally required, unless dictated by unique site considerations. When such unique situations occur, consult the appropriate area office for further information.

- Use at least eight-foot long copper clad ground rods. Multiple ground rods are better than one especially in dry climate or sandy-rocky soil areas.
- Bring the transmission line off the tower with the sharpest bend permitted by the manufacturer's specifications and make a solid bond between the tower and transmission line sheath just prior to the bend. The sharp bend acts as a spot impedance to the extremely high strike current. This shunts more of the strike current into the tower ground rather than into the equipment. Use no more or no less than the minimum bend radius wherever the transmission line changes direction and introduce a change of direction at every reasonable opportunity. Then, ground the transmission line sheath at the antenna side of each bend in the transmission line.
- Keep the tower grounding resistance as low as possible. The lightning stroke current belongs in the tower structure and grounding system, not on the transmission line.
- Provide additional grounding to the transmission line sheath wherever possible. Make it a point to ground the transmission line where it is supported on poles and where it enters a building.



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Unprotected power/control lines and antenna installations can be hazardous to equipment and personnel.

- It is wise to take at least part of the transmission line through a length of grounded conduit.
- **Bond all equipment cabinets together to a single point.** Then, ground that point to a grounding rod network using as short and as straight a ground wire as possible. If bends in the ground wire are necessary, make them as large a radius as practical.
- Transmission lines should be brought into the equipment cabinets adjacent to the single point ground connection where a good low impedance bond can be made with the transmission line sheath.
- Install a gas tube protector between the equipment cabinet ground and AC-neutral where it enters the equipment cabinet. Install gas tube protectors where the control lines enter the building and at the point of entry into the equipment cabinet. Also, install gas tube protectors wherever control lines enter a building and install additional protectors as close to the remote control console as possible.
- Keep ground wires from gas tube protectors to ground rods or perimeter grounds as straight and short as possible. Avoid sharp bends in ground wires.
- Never bundle a ground wire with any other cabling or wiring. Also, never run a ground wire along any metal wall, along any electrical conduit, or inside a conduit.

Remember, the lower impedance the grounding system is in relation to the equipment being protected, the greater the protection afforded to the equipment. Keep the lightning strike current in the grounding network; not running through the equipment to ground.

RECOMMENDED PROTECTORS

The devices listed below are available from your local Motorola Parts Center. Other devices are available from different manufacturers for special applications and may be used in place of those listed herein. Installation instructions are generally packed with each device. The following listing contains phone line suppressors, ac line surge protectors, coaxial cable in-line lightning arrestors, and coaxial cable ground clamp kits. Refer to the Motorola Buyers Guide for additional information.

PHONE LINE SUPPRESSORS

TRN8187A Single Line Suppressor, 3-electrode gas tube protector

TRN4589A Dual Line Suppressor, 3-electrode gas tube protector

RRX4021B Single Line Suppressor, 3-electrode gas tube protector

AC LINE SURGE PROTECTORS

TLN4399A AC Line Surge Protector, 117 V ac line, 7/8" x 14 conduit hole mounting

TLN5920A AC Line Surge Protector, 240 V ac line, 7/8" x 14 conduit hole mounting

RRX4017A AC Line Surge Protector, 117 V ac, 10 Amp, single phase, screw terminal connector block

RRX4018A AC Line Surge Protector, 117 V ac, 10 Amp, single phase, 3-prong plug and receptacle

RRX4019A AC Line Surge Protector, 117 V ac, 15 Amp, single phase, 3-prong plug and receptacle

RRX4020A AC Line Surge Protector, 220/240 V ac, 30 Amp, single phase

COAXIAL CABLE IN-LINE LIGHTNING ARRESTORS

RRX4024 UHF type connector

RRX4025 "N" type connector

RRX4032 Tower Mount Kit

COAXIAL CABLE GROUND CLAMP KITS

ST-788 For 1/2" jacketed heliax and pipe or grounding rod

ST-853 For 7/8" jacketed heliax and pipe or grounding rod

ST-789 For 1/2" unjacketed heliax, includes bushings for better contact without collapsing line

ST-790 For 7/8" unjacketed heliax, includes bushings for better contact without collapsing line

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**SYSTEM MANAGER'S
OPERATING MANUAL
For SMARTNET II™**

Trunked Radio Systems

**T5184 SMARTNET II Central Controller
and Options D162, D163, D401, D413 and D436;
and T5188 Telephone Interconnect and Option D401**

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